University of Alberta

Transferable Water Rights in Alberta

by

Ruth Eileen Freeman

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Science.

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Transferable Water Rights in Alberta submitted by Ruth Eileen Freeman in partial fulfillment of the requirements for the degree of Master of Science in Agricultural Economics.

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Abstract

The current water management system in Alberta is not able to deal with the increasing demand for water and the high cost of developing new supplies as Alberta enters a mature phase of water development. One potential means of change introduced in the province's new *Water Act* is the introduction of transferable water rights. The use of transferability is seen as a way to promote the efficient use of water in Alberta through the reallocation of existing water licenses. Both the United States and Australia have used transferability as a means to reallocate water to new uses under conditions of increasing scarcity. Their experience provides the basis for this evaluation of how transferability should be introduced into Alberta's water management system and how it should function to promote the economically efficient use of water.

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I. Introduction

The management of water resources in Alberta is controlled by legislative, judicial and administrative policies. The form of management has been in place for over a century and given the monumental changes in society, technology, and economics it is questionable if the current policies are still effective management tools. Reform of water management will be critical to maintaining the efficient and effective allocation of water in light of increasing demand for this limited resource. Indeed, the *Water Resources Act* in Alberta is currently under revision and one of the drafted reforms is to amend the Act to permit the transferability of water rights.[1] Under current management practices, water is often locked into lower valued use, efficiency in water use is not achieved, and the growth of the regional economy, in the face of increasing water scarcity, is impeded. In Alberta, as elsewhere in western North America, the agricultural sector is by far the largest user of water (see Figure 1) and yet, paradoxically, agriculture tends to be a marginal, low-valued use of water. As Alberta's water economy enters a mature phase where the development of new water supply sources are no longer feasible, water management institutions must be able to deal with the changing and conflicting demands of water users. The current water law and management practices in Alberta are not designed to deal effectively with these issues. Reforms are needed to promote the efficient and effective allocation of Alberta's water resources.

Transferability of water rights is a method by which water can be shifted to higher valued uses and users, independent of the land or project, thereby realizing a more effective and efficient use of the resource. Transfers of water use within agriculture, and between agriculture and other higher valued uses, is central to improved water conservation and management.

The purpose of this thesis is to provide an evaluation of Alberta's current system of water rights as well as a preliminary assessment of issues, problems, and advantages which are involved with a system of transferable water rights. Included in this assessment is an historical overview and economic critique of the system of water rights in Alberta and a consideration of how the introduction of transferable water rights could improve the efficiency of water allocation in Alberta from an institutional and economic basis. To provide a basis for the evaluation of the potential for transferability in Alberta, this thesis will outline the criteria that are necessary to provide for the efficient and effective use of water. These criteria will then be used to evaluate why Alberta's existing water laws impede the economic decisions of water users, thereby failing to promote the efficient and effective use of Alberta's water resources. To provide examples of how transferability can be used to better manage water resources, the water rights experiences and reforms in the Western United States and Australia will be examined. It is hoped that information on how other countries are promoting improvements in water management, through transferability, in the

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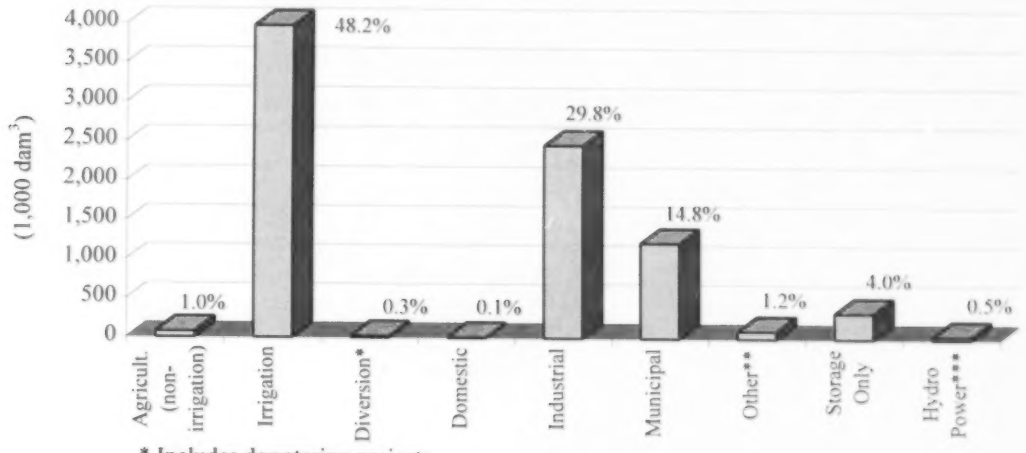
[1]The new *Water Act* was passed by the Alberta Legislative Assembly in August, 1996 just as this research was being completed. An evaluation of how the proposed (now enacted) changes to the *Water Resources Act* may facilitate or impede the introduction of transferable water rights into water management in Alberta is included in Section VI: "Introducing Transferable Water Rights", page 47.

face of water shortages and changing demands on water supplies will provide valuable lessons for Alberta. Given these experiences, a review of the requirements necessary for the smooth functioning of transferability and the potential negative consequences associated with the introduction of transferable water rights will be completed. Finally, a brief overview of how an hedonic model, which derives the value of a marketed good's characteristics, could be used to value water rights, and to assess the benefits of introducing transferable rights, will be provided.



* Includes dewatering projects.

** Other like purposes (eg. parks, golf courses)

*** Hydro Power projects are not usually assigned allocation.

Figure 1: Annual Licence Allocations for Water in Alberta (as at April, 1996)[2]
(Developed by the author with information provided by Alberta Environmental Protection, Water Resources Administration Division, 1996.)

It must, however, be noted that transferability is only one portion of a water management system; the balancing of economic and environmental concerns is key to an effective water management system. Meeting the changing demands of water users, incorporating the desire to allocate limited water resources to higher valued uses, and ensuring that the resource is efficiently allocated and effectively consumed in the face of increasing scarcity is a difficult balancing act. Transferability must be considered as just one element in a total water system.

[2]The above diagram represents total allocation of water in Alberta, not the actual use. The reporting of water use in Alberta is limited by the historic provisions of the water licences. Older licensees and small users are not required to report their use; therefore, the above statistics may not be completely representative of water use in Alberta. These allocations do, however, provide a indication of the relative patterns of use.

II. Alberta's Water Law

Laws governing the management and control of water are the result of historic social, economic, and environmental conditions. They are, and should be, always adapting to the new requirements of water users. Alberta's current management system is under increasing scrutiny to see if it meets the needs of modern society. The ability of the water law to allow and promote the efficient use of this resource is an important part of this analysis.

A. The Evolution of Water Law

Alberta's water law has developed, to a great extent, in response to the historic demands of its users. It has developed from a system of riparian rights, imported from Europe, to a system of administrative apportionment. Under a system of riparian rights land owners had the right to extract and use any water that was adjacent to their land. The only restriction on this use was that the riparian's use could not substantially interfere with the use of any downstream riparians. This system was imported by settlers in Eastern Canada and, as settlement moved west, Western Canada. The riparian system of allocation was, however, more suited to areas where the water supply was abundant, such as Eastern Canada. The system, based to a large extent on English civil law, had no mechanisms for dealing with the semi-arid conditions and water shortages experienced in Alberta. The riparian system of water management often restricted the development of projects in areas not adjacent to water. This included irrigation which was playing an increasingly important role in Alberta's agricultural development (Percy, 1977). Development of much of the land in Southern Alberta was not possible under the riparian system since it made no allowance for the diversion of water to land not adjacent to the water supply. Thus, allocation of water in Alberta by means of riparian rights was unable to "maximise economic potential of water in conditions of scarcity" (Percy, 1977, 143) and inhibited development of irrigation and settlement in many parts of Alberta.

In response to the inadequacies of the riparian system and increasing pressure from irrigation companies, the *Northwest Irrigation Act* (1894) was enacted. Based on the Australian and American experiences with the riparian system and on their responses to its inadequacies, this law developed a framework for the management of water in Alberta. Riparian rights were restricted by placing the control over water allocation in the hands of the government, and the concept of prior appropriation was introduced into water management. By placing ownership of water in the hands of the province, the *Northwest Irrigation Act* enabled the government to control the actual use of water resources. The prior appropriation structure used a system of allocation which prioritised water distribution in times of scarcity according to when a person or company began using the water. Alberta's current water legislation, the *Water Resources Act* (1931), incorporated these basic principles. The province's ownership of water and, therefore, its ability to control the allocation of water, was confirmed by the courts in the late 1930's[3]. The Act was further

[3]Licences or permits issued prior to 1931 are governed by the conditions under which they were formed and fall under the requirements of the *Water Resources Act* only when the Act is not inconsistent with the original provisions. Also, holders of these rights may acquire further licences on the same terms (*Water Resources Act*, (continued)

amended in 1962 to include ground water.

B. The *Water Resources Act* (1980)

Under the current *Water Resources Act* (R.S.A. 1980, c.W-5) the ownership of the water is vested to the crown and land owners can use the water for other than domestic purposes only if they obtain a licence from the government to do so. The procedure to obtain a licence for consumptive, management, or recreational uses includes making a formal request which outlines the proposed use. Uses outlined by the Act, in order of preference, are i) domestic; ii) municipal; iii) irrigation and other agricultural purposes; iv) industrial purposes; v) water power; and vi) other like purposes. Other non-consumptive uses provided by the Act are impoundments, diversions, or uses of water for water management, flood or erosion control, flow regulation, conservation, recreation, or the protection of wildlife (Section 11(1)a-e). Once a written application is filed with the Minister, public notification must follow. Notification can be either through posting "in a conspicuous and public place" in Municipal offices and on the proposed site for 15 days, or publishing in a local newspaper (designated by the Minister) for at least two consecutive weeks (*Water Resources Act*, Section 16). The requirement for notification may be waived if the Minister considers it "expedient and fit and proper" to do so (*Water Resources Act*, Section 19). The Minister also provides copies of applications, as well as copies of the licences or interim licences, to the Energy Resources Conservation Board (ERCB). Objections to the proposal must be filed within 30 days and the minister or his representative then rules on the validity of the objections. After reviewing the application and any objections to the application, the Minister may grant an interim licence authorising construction to begin on the proposed works. After the construction is completed and approved, a final licence is issued.

According to the Act, conditions may be placed on the licensee; however, in actuality, almost all requests for licences are granted, no matter how much water the licensee is planning to use or how inefficient the use may be (Percy, 1980). All licences must specify the land or undertaking to which the licence is to be appurtenant and the licence is considered to be inseparable from this land or undertaking. Usually, a licence is made appurtenant to a parcel of land. The reasons a licence would be considered to be appurtenant to a project rather than a parcel of land are not well defined in the Act. In the past such linkage was limited to a few projects, such as water use by the railway. It has, however, recently been used when attaching the licence to the land would be too inflexible for the intended purpose. Such is the case when the water is intended for irrigation. A licence issued to an irrigation district is made appurtenant to the project, namely irrigation, so that when the boundary of the district changes a new licence is not required.[4]

Licences are considered to be legal contracts, issued for an indefinite period, and can only be cancelled under very specific circumstances if the user (i) ceases to use the

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Section 10).

[4]Licences issued to irrigation districts are given priority on the same 'first in time first in right' principle as all other licences. However, within irrigation districts the allocation of the water is usually based on an apportionment system.

water rights or (ii) breaches any conditions of the licence[5]. The Minister must, however, have undertaken at least two inspections which indicate that the licensee has ceased to use the licence and there is no indication that he has been using the license between inspections of the work in question before he may proceed with a suspension or cancellation (*Water Resources Act*, Section 51.(1)-(2)). The licensee may appeal this decision to the Court of Queen's Bench. A license is forfeit if the licensee breaches the implied conditions in the licence; for example, if he defaults on any payment; breaks any regulations laid out in the Act; does not abide by the conditions of the licence; has been given the licence in error; or, is found to have committed fraud to obtain or use the licence. In these instances, the Minister may, but need not, suspend or cancel the licence. If none of these conditions apply, a licence can generally be cancelled only if it was issued appurtenant to provincial land or expropriated by the Crown and the resources is now required for a power project (*Water Resources Act*, Part 2: "Relating to Water Powers"). Given these very limited criteria, licences are rarely cancelled. Licences are effectively issued in perpetuity (Percy, 1980).

There is, however, another provision in the *Water Resources Act* for the cancellation of a licence. If there is an application for a licence in a fully appropriated area, the applicant may appeal to the Minister to have an earlier licence or interim licence of a lower purpose[6] cancelled, in whole or in part, "to the extent necessary to meet his requirements" (*Water Resources Act*, Section 11(4)). If the Minister approves of the new application, cancelling the old licence, the person whose licence is cancelled may claim compensation from the Minister. Although this provision has not yet been used, as water resources become fully allocated it provides a way to gain a new licence (Russell, 1984). Once used, it will become a source of increasing conflicts between water users as well as a source of uncertainty in water management and supply[7].

If the licence is issued in conjunction with a parcel of land, the use of the water is tied to the ownership of the land and to have use of the water you must purchase the land. If a licence is appurtenant to a project, rather than a particular parcel of land, it may, in theory, be transferred with the approval of the Minister. The licence remains linked to and, "inseparable from the undertaking, so it must...be necessary to purchase the entire undertaking in order to acquire the water right" (Percy, 1977, 149). Even when a water right is purchased in conjunction with the land or a project, the water use must be for the original or a 'higher purpose'.[8] The higher purpose is derived from the aforementioned preference list. This priority list was initially formed in the 1920's and tends to reflect the priorities of the 1920's rather than those of modern times (Percy, 1987). Thus, a water right used for irrigation cannot be changed to be used for industry because industry uses are a lower

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[5]An additional circumstance when a licence may be cancelled is when a licence is considered to be appurtenant to land that is either leased from or being sold by the Crown. The Minister may cancel the licence should the sale be cancelled or the lease become expired.

[6] The priority of the uses are as outlined previously.

[7]As discussed in "Water Management and the Government", page 8, political involvement in management decisions may result in decisions being based on political 'whim' rather than long term economic and legal planning. Competition between water users, under this provision, must be based on, and perceived to be based on, sound management practices and not political motivations.

[8]If the licensee wishes to change to a higher purpose use, the old licence is cancelled and a new licence is issued. The priority of the old licence is, however, retained.

purpose. The only way to change the use to a lower purpose is by an Order in Council issued by the Lieutenant Governor (Nichols, 1992). While older licences may not necessarily specify a particular use, generally any change in a right must be to a use with a higher purpose than the original use. Any new licence that is issued in this manner retains the same priority in time as the old licence.

Security of the licence holder is based on the date that the licence was issued and new licences are, in theory, granted only if they will not interfere with the existing licensees' use of the water. According to the Act, in times of shortages those with the oldest licences are entitled to the whole of their entitlement before any licensee with a newer licence: the principle of 'first in time, first in right'. In actuality a system of voluntary rationing is used; however, there is no legal way the government can enforce the rationing if a holder of an 'older' license is not willing to agree. Future shortages may result in the enforcement of rationing according to the 'first in time, first in right' principle[9]. Conflict arising from such enforcement seems inevitable.

C. Irrigation Districts

Since much of the *Water Resources Act* was designed to deal with irrigation and since many water rights in Alberta, especially Southern Alberta, are held by water districts, it is important to understand the nature of irrigation districts and the method by which irrigation districts are managed. Irrigation Districts were initially designed to allow for the management of irrigation systems by groups of farmers or boards of trustees. Irrigation districts enabled neighbours to band together to build irrigation systems when individually such a project was not feasible, or to have greater control over the management of existing systems (Gisvold, 1956, 90-93). The *Irrigation Act* (1968) transferred control of the licence to the irrigation district and the management of the licence to elected Boards of Directors. The provisions of any previous, privately held licences would still apply to the district's licence, thus ensuring stability in the transfer.

The Act incorporates several regulations that were designed to deal with the allocation of water under licences which are appurtenant to irrigation projects or districts. Several of these regulations, however, are unenforceable. For example, in order to keep irrigation companies from engaging in price discrimination, the Act specifies that "[n]o licensee undertaking to supply water conveyed by his works shall discriminate between the users of the water regarding its price" (Section 37). The Minister has been given the right to inspect all controls over the supply of water to consumers. However, the regulation can be interpreted in various ways. It could mean that the licensee has to charge everyone the same price; charge everyone on the basis of costs associated with supplying the water; or charge everyone on the basis of a flat rate that is determined by the costs. Another requirement is that where a licensee is selling water, such as in the case of irrigation districts, the licensee must in times of shortages allocate the available water proportionately among all users. Penalties specified by the Act are minor; fines for discrimination by water suppliers cannot

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[9]The *Water Resources Act*, does stipulate that the Lieutenant Governor may, by declaring an emergency, suspend any licence or interim licence, or "designate purposes for which, and quantities in which, water may be used" (Section 13). Compensation must, of course, be paid.

exceed $1000 and jail terms cannot exceed three months. The Minister may take over any irrigation works if the licensee does not supply water for irrigation to all those entitled to receive them (or if the licensee becomes bankrupt or insolvent, or fails to operate the works). However, the licensee may, within two years, resume control over the works by proving to the Minister he is able to carry on the works. Finally, the regulations incorporated into the act were designed to deal with one form of water use - irrigation. They are simply not applicable to many of the new water uses now in place.

D. Riparian Rights and the *Water Resources Act*

The continued existence of riparian water rights in Alberta is another facet of water use that affects its management. Although the *Water Resources Act* does restrict riparian rights, it does not eliminate all of them (Percy, 1977). The *Water Resources Act* retroactively gives "the title to the beds and shores of all rivers, streams, water courses and other bodies of water to the Crown" (Percy, 1977, 168). In interpretation, the word 'shore' is taken to be the strip of land exposed when the water level is low, not the land or bank adjacent to the water body. The land adjacent to the water body is still owned by the land owner and the right to use the water (for any use not specifically requiring a licence, such as domestic use), is still in force. Also, the Act states that "Nothing in this Act requires a person who owns or occupies: (a) land that adjoins a river, stream, lake, watercourse or other body of water, or (b) land under which ground water exists, to obtain a licence or permit under this Act for the use of as much of that water for domestic purposes on that land" (Section 2). The Act allows these persons to "pump or otherwise convey water to fill a tank, cistern, trough or dugout" without a permit or licence (Section 3). Thus, a land owner's use of water for domestic purposes[10] is still covered by the riparian doctrine. Although this right has never been legally challenged in Alberta, similar riparian rights in Australian laws have been upheld by the courts (Percy, 1977). Also, the Act was designed to prohibit the *exclusive* rights to water; however, riparian rights are not exclusive. This implies that riparian rights are not necessarily eliminated by the *Water Resources Act*. The rights of a riparian are, however, curtailed by the act. For example, a riparian user has no right to the exclusive use or the permanent diversion of water and cannot use the water for other than domestic purposes without obtaining a licence, unless the use was in place prior to April 1, 1931. If a permit for the diversion of water was issued prior to April 1, 1931 the holder may exercise the right to extract water under the conditions of that permit. The *Water Resources Act* applies only if its regulations are consistent with the legislation under which the permit was granted. This exception is, however, rare. The riparians' rights are also superseded by the rights of a licence holder. The, "downstream riparian (has) no right of action when the flow of the stream (is) diminished by an appropriation licensed under the *Water Act* (Percy, 1977, 160). The riparian can only place an injunction on a licensee if the licensee is acting outside the bounds or conditions of the licence. If the upstream user is not licensed, the riparian system is in force. Riparian rights do, however, prevail over all types of users when one considers water quality. The riparian has the right to undiminished quality of the water

[10]Domestic purposes are defined by the Act as purposes for household requirements, sanitation and fire prevention, watering domestic animals or poultry, and irrigating a garden of less than 0.5 hectares.

flowing downstream, even if the upstream user is licensed. It must be noted that although the existence of these types of riparian rights have not been challenged in the Alberta courts, similar legislation in Australia has upheld these rights. The continued existence of Riparian Rights may also adversely affect water management concerns such as in flow stream protection, wild life and habitat preservation, and recreational uses. These effects will be discussed later.

E. Water Management and the Government

The *Water Resources Act* provides a system of administrative apportionment. The government, through Alberta Environmental Protection, reviews and grants licences, and controls the allocation of water during times of scarcity. This control has resulted in some discretion in the enforcement of the Act. For example, statutory authorisations, which provide temporary rights of usage without issuing a legal licence, are often used, bypassing the legislative requirements of the *Water Act*. Since these authorisations have no real legal basis and are maintained at the discretion of Alberta Environmental Protection, the issuees have little legal protection. This lack of legal protection means that the issuing of water rights can be strongly impacted by political 'whim' rather than being based on a long term, economic and legal plan. The uncertainty inherent in the authorisations increases the risk associated with the long term planning of a holder. Additionally, as mentioned previously, the *Water Resources Act* includes provisions for the cancellation of licences at the discretion of the Minister, if a request is made for a licence of a higher priority in a fully appropriated area. Although the relocation of water to a use of higher priority may seem beneficial, it must be remembered that the current priority system is outdated and does not necessarily reflect the best economic value of water use. The ability of the Minister to cancel existing licences in such a manner may increase the uncertainty of the licensee without consideration for the actual benefit to society. Currently, there is little uncertainty associated with this provision only because it has not yet been used. As water becomes fully allocated, this provision will become a source of increasing uncertainty.

One other organisation which influenced water management in Alberta was the Water Resources Commission. Established by the *Water Resources Commission Act*,[11] the commission was made up of representatives of the Legislative Assembly, members of the public, and representatives from the Departments of the Environment, Economic Trade and Development, Municipal Affairs, Agriculture, Forestry, Lands and Resources, and Transportation and Utilities. The commission was responsible for assessing and reviewing long term water resource planning by the government, evaluation of both short and long term water related projects, monitoring intergovernmental relations affecting water resources, and generally advising the government on water resources. The Water Resources Commission was, therefore, one of the influences over water legislation and management in Alberta. The diversity of its members helped to ensure that all areas affected by water management had a say in how water was managed.

One final factor affecting the management of water in Alberta is geography.

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[11]This act expires on December 31, 1997. The Commission itself was, however, disbanded at the end of March, 1995 due to government cut backs.

Waterways cross provincial borders. A river, for example, could be controlled by Saskatchewan law at one point, and Alberta law at another. This tends to limit both provinces' control over development of water resources. In a 1975 decision by the Supreme Court, it was determined that any "upstream province could not validly license acts within its boundaries which had injurious consequences in other jurisdictions" (Percy, 1980, 13). Provincial control over such waterways are, therefore, mitigated by the rights of other provinces. The effect of any water management changes on cross border flows must be considered to ensure that the rights of other provinces are not breached.

III. Evaluating Water Institutions

Water institutions provide a framework for economic behaviour; they are a major influence and constraint on economic activity. Because water institutions are generally governed by laws and regulations (water law is generally the most significant water institution) rather than by market forces, standard economic criteria, which tend to treat institutions as a constraint for optimisation theory, should not be used exclusively as a yardstick by which to measure the success or failure of the institution over time. "Economics cannot define a social optima which law should realize." (Ciriacy-Wantrup, 1985, 99) Indeed, the maximisation principle is a "construct" that provides information which helps one understand, explain, and predict, but often requires assumptions, to formalise activities, which are too restrictive to be helpful in policy evaluation. Policy evaluation should be concerned with less concrete and more long term performance evaluations.

An evaluation of water law should be an evaluation of the policy which governs water use and allocation. It is better to consider how the policy either promotes or impedes 'economic well being',[12] and the possible impact a change in law may have, in both direction and relative magnitude, over time rather than evaluating the quantitative effect at one time (Ciriacy-Wantrup, 1985). Institutions must be regarded as tools or objectives by which to achieve economic well being. Thus, they must be evaluated based on a set of criteria which reflect how the institutions facilitate the movement towards the policy objective (assumed to be a form of 'economic well being' defined by the policy makers).

To determine how policy can ensure that individuals "make...decisions compatible with the social objectives and yet to provide sufficient co-ordination to make [them] consistent with one another" (Howe, Schurmeier, and Shaw, 1986, 439) evaluations of water institutions, from an economic perspective, must consider how the institutions influence economic behaviour. In other words, when evaluating water institutions it is necessary to evaluate how they influence the actions of water users. This is the best way to determine whether an institution will promote or hinder economic well being. Several criteria have been developed and are widely used in evaluating the influence of water institutions and water law on the actions of water users[13]. Chief among these criteria are security and flexibility.

A water institution must provide water users with security. This criterion is fairly logical because as economic agents water users are risk averse - they do not want or like uncertainty. Uncertainty for water users takes two forms: physical uncertainty which arises

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[12]Economic well being is used here in an extremely general sense. In subsequent chapters water allocation and transferability will be evaluated and 'well being' will be understood in terms of conditions such as economic efficiency, social welfare, and conservation. The relative weights attributed to these conditions will always be shaped by the desired outcome of the policy makers. Thus, the actual definition of 'economic well being' will also vary depending on these policy objectives. It is not the purpose of this paper to set the weights; however, a general definition of movement towards 'economic well being' will be interpolated from various sources on the evaluation of water institutions (see Note 13), and will be considered as movement that provides a more efficient use of a water resource and net benefits to both water users (consumptive and non-consumptive) and society.

[13]These criteria or some variation of them have been outlined by Wantrup (1985), Howe, Schurmeier, and Shaw(1986), Kelso, Martin and Mack (1973), Gibbons (1986), and Pigram *et al* (1986), to name just a few.

from changes in the water supply (both quantitative and qualitative) due to natural forces; and tenure uncertainty which arises from changes in the water supply (again, both quantitative and qualitative) due to the unilateral or unlawful acts of others.

Physical uncertainty, or a lack of physical security, occurs when there are variations in supply due to drought, dry seasons, etc. The resulting decrease in instream flows means that there may not be enough water in the system to meet the allocations of all users. In a fully allocated stream physical uncertainty is a major consideration for rights holders with low priorities (whether the priority is determined by the use, location, or age of the right), since the water is allocated to senior rights holders first. Storage provides some protection against physical uncertainty; however, ultimately it is difficult to mitigate physical uncertainty or to provide physical security through water policies or institutions.

Tenure security, on the other hand, is dependent on water institutions. Tenure uncertainty arises from the "unilateral and capricious acts of other men that may deprive the water right holder of the fruits of his actions or may shift to him losses stemming from the actions of others" (Kelso, Martin and Mack, 1973, 53). Thus, to provide the water user with tenure security, a water institution must assure him that he can continue to use his right over time and that this use will not be threatened by the unilateral actions of other users. This type of security often depends on establishing clearly defined rights in terms of priority, quantity and quality, time of use, type of use, and location of diversion. Given a clearly defined base it is much easier to determine if harm is or will be done. Establishing the 'ground rules' and recourse, when the rules are broken, for both the institutions and users (public and private) is one of the main ways in which tenure security can be established. The enforcement of these ground rules is critical to maintaining this security. Rules mean nothing if they can be broken with impunity. To alleviate the rigidity of this enforcement, the qualification of compensation may be used. That is, security against harm by others may be amended to read security against uncompensated harm by others.

Security is an important influence on the economic activity of water users. If rights are considered to be both stable and protected from unilateral harm, users will be more willing to invest in the development of their right and maintain it as an important asset. A person is generally not willing to invest in a new irrigation system if, in the future, their neighbour could pollute the river or divert excess water and cause a shortage. Indeed the promotion of investment through a high level of tenure security may in turn increase physical security. If the new irrigation system results in less evaporation, the physical security of supply may also ultimately increase. "...[L]ong run tenure security ...encourages group investment in, and group management of, water to enhance the physical security of their water rights." (Kelso, Martin and Mack, 1973, 58) This is one way in which the actions of senior rights holders, who are not always affected by physical shortages, may be encouraged to indirectly promote physical security. This may be especially important in a mature, fully allocated system, where physical uncertainty is a very real problem.

Water law and water institutions are developed to meet the needs of the water users, but the needs of the water users constantly change. Water institutions must be able to adapt to seasonal changes as well as long term changes in demand, population, technological, and economic structures (Howe, Schurmeier, and Shaw, 1986). Flexibility enables a change in water use, delivery, and development that is "made imperative by changing conditions, institutions, technology, population and preferences" (Kelso, Martin and Mack, 1973, 53).

Loosely put, it allows the 'supply' to change to meet the 'demand'. An evaluation of flexibility will focus on what limits or promotes changes in the allocation of water. There are, of course, physical limits to flexibility, such as distance and topography, however, it is often difficult to change this natural inflexibility. An evaluation of water is often focused within a single geographic region and most physical limits to change are not generally applicable. The evaluation of flexibility in this thesis will, therefore, focus on the institution(s) enabling the water users and use to change as circumstances change.

At first glance requiring a system to be able to change may seem in conflict with demanding security and knowledge of the 'ground rules'. However, security does not include protection from change; security is protection from harm caused by the unilateral acts of others. Flexibility that is based on consultation, negotiations, agreement, and compensation (if required), is not unilateral and, in most cases, will not cause harm. Flexibility and security also focus on different areas of water management; while security focuses on clearly defined rights and knowledge of the institutional rules, flexibility focuses on the allocation of water. An allocation or right may change but the change does not threaten security as long as the change and its impacts are known. To ensure this knowledge transfer, protection conditions, such as 'no harm', are often incorporated into flexibility provisions.[14] The criterion for the predictability provided by such protection and knowledge of transfers will also be discussed below. At the same time that flexibility must consider security provisions, policies aimed at promoting security must consider flexibility. It must ensure that the protection of rights does not limit the ability of the institution or of the appropriation right to change.

The need for flexibility does not demand that all water must be transferable, only that within a given area there be a "tradable margin" that is subject to reallocation (Howe, 1990). Additionally, the promotion of flexibility does not mean that change should be made mandatory, with a few notable exceptions such as foreclosure or abandonment where the use is not deemed to be beneficial or is no longer used. There is no obligation for a rights holder to change his use; flexibility merely says that he *can* change his use. His security in his right is not threatened since the decision and its consequences are his own.

Since water use is generally attached to the ownership of a licence and not physical ownership of the water, the allocation of water is also generally driven by administrative laws and regulations and not by economic demands. Flexibility within the laws and regulations is necessary to allow the use of the water to change according to these economic demands. It must allow the allocation and use of the water to change as the social and economic reality changes. For example, a common feature of water institutions is a priority system for water rights. If priority is based on the type of use, the hierarchy of different uses is determined by the social and/or economic needs present when the law was ratified. Over time the social and economic needs change, but if the water institutions lack flexibility they cannot change to reflect these new needs. The priority hierarchy becomes obsolete and the allocation and use of water no longer meets the needs of society.[15] Flexibility also promotes

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[14]Some institutional protections will be examined in the preceding sections dealing with water law and transfers in the United States and Australia, and in the section dealing with transferability.

[15]As will be discussed later, this is the case in Alberta where inefficient use of water is facilitated by a hierarchy that (continued)

the development and use of new technology and industry. Enabling changes in use may also enable new water users to enter the picture or promote the introduction of new technology into existing water uses. Flexibility allows adaptability and adaptability is vital to a well functioning economic structure.

A criterion often linked with flexibility is the existence of some form of predictability or certainty of outcome, for with flexibility often comes the fear of change. This fear may also act as a constraint to true flexibility, therefore, the fear must be alleviated. To help alleviate the uncertainty of outcome, it is important that an institution which incorporates flexibility also incorporate mechanisms which will inform other users of the impact change will have on them. There must also be some provision for the protection of these other users from the harm which could result from any changes. When these two mechanisms are in place uncertainty and fear can be minimised and smooth transfers, to accommodate changing social and economic demands, are possible.

With the flexibility to make economic decisions comes the necessity to ensure that the decisions are fully informed decisions. Water institutions must be designed, therefore, to ensure that water users know the true opportunity cost of the water use. The opportunity cost can be defined as the value which would have been realized had the water been put to another use (generally the best alternative use). For example, if a certain amount of money was spent today instead of being put in the bank, part of the opportunity cost could be the lost interest. The water user must make a fully informed decision regarding water use. By ensuring that the opportunity cost is a factor in decision making, the economically efficient use of the water resource is promoted. A user faced with a distorted cost will not make an informed decision and some value that may have been realised if the true cost were known may be lost.

Opportunity cost must include consumptive and non-consumptive uses, such as recreation. Although some tools have been developed to value non-consumptive uses, which are generally non-market uses, it is still difficult to quantify their true importance. Still, these uses must be reflected in the true opportunity cost. It is also important to include the social opportunity cost to ensure that social values and needs are considered in the allocation process. Consideration of social values, such as water quality, instream flow protection, and amenity value, which may not be included in the water user's decisions, should be incorporated into a water institution's management system. This requirement has, in recent years, been recognised as an important consideration in economic decision making.

Finally, a water institution must be fair. Fairness is an underlying principle in all of the above criteria (no unilateral decisions, clear rules, non compulsory change, etc.) and must be present to ensure that these criteria are adequately addressed by users and institutions. To ensure the smooth functioning of economic decisions it is important that no one have or be perceived to have an advantage. Security, flexibility, predictability, and incorporation of opportunity costs and social values all require that everyone face the same constraints and be governed by the same rules. If fairness does not exist, the criteria become distorted and economic decisions arising from them are useless. Although the

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was developed in the 1920's.

existence of these criteria may not always ensure that economic efficiency is achieved, "they are certainly conductive to the attainment of efficiency in the real world" (Howe, Schurmeier, and Shaw, 1986, 440).

A. An Economic Evaluation of Alberta's Water Law

Alberta's water law has not needed to promote the economically efficient and effective use of water. An evaluation of how the water law and institutions promote or impede the economic decisions of water users, and therefore the efficient and effective water use, can provide valuable insight into determining the direction Alberta's water management practices should take. Criteria for this evaluation, outlined in the preceding section, includes the need for the user to be secure in his use of the water right, for the water institutions to be flexible as the needs of the water users change, some measure of predictability or certainty about the impact of possible changes, payment of the true cost of water by users so decisions are based on the real value of water, consideration of social values and incorporation of these values in to the allocation process, and equity in the management of the institutions. As will be seen, these criteria, which sometimes overlap, when taken as a whole provide a clear picture of how water users in Alberta, as economic agents, are affected by water law.

Security for a water user falls into two categories: physical security and tenure security. Physical security involves protection from natural changes in the water supply. Tenure security involves the protection from the unilateral actions of others. As Alberta's water systems become fully allocated, physical uncertainty will increase. The potential for physical uncertainty due to causes such as drought is addressed by the *Water Resources Act*; however, the current management practices have failed to promote physical security. According to Percy, "the law allocating water rights is a substantial factor in the shortage that now exists in parts of Western Canada" (Percy, 1980, 3). This failure is due to several causes.

The system of prioritising licences according to time provides a mechanism by which water may, in theory, be allocated during shortages. This priority system, however, does not provide physical security to junior rights holders. Indeed, the 'first in time, first in right' principle increases the physical uncertainty of junior rights holders since senior holders are entitled to their full allocation before the junior holder receives any water. Senior holders are, therefore, not usually affected by shortages and are unlikely to invest in mitigation efforts, such as storage facilities. Junior rights holders will need such facilities to increase their physical security and, unless changes are made to promote a higher level of physical security, future demands will only increase these shortages. Although Alberta does not currently rely on this prioritisation method during times of shortage (historically relying on a system of voluntary rationing instead), it is the only legal means provided for in the *Water Resources Act*. As water becomes fully allocated there will be an increased potential for shortages and physical uncertainty will increase. Senior rights holders will turn to the *Water Resources Act* and the 'first in time, first in right' prioritisation to mitigate their physical uncertainty. Junior rights holders and new users will be faced with increased physical uncertainty and increasing risk associated with investment in their water right. As risk increases, water users will be less and less likely to invest.

Physical uncertainty arising from the 'first in time, first in right' priority principle not only fails to promote investment, but also fails to promote the economically efficient use of existing water resources. Since this principle provides priority based on time only, there is no managerial control over which user has a senior right, and there is no guarantee that the senior uses which are given priority are economically beneficial. Thus, the 'first in time, first in right' type of rationing does not ensure that uses with higher economic value have higher priority and, therefore, greater physical security. Indeed, in Alberta much of the land has, historically, been used for agricultural purposes. Licences attached to these lands often have a higher priority than licences granted later for industrial or municipal uses. This results in higher physical security for lower value economic uses and lower physical security for higher value uses.

The actions of others also affects the security of the water user. Protection from the unlawful actions of others is, therefore, also important. One of the best ways to provide this tenure security is by providing a clear definition of the water rights and ground rules of water management. Here Alberta's water law does provide some measure of tenure security. As detailed in the explanation of water law in Alberta, the *Water Resources Act* outlines the process by which a licence is obtained and requires applicants to state how much water is involved and its proposed use. In practice, however, the *Water Resources Act* provides few guidelines by which to evaluate proposed licences. In the past this has resulted in very few licences being refused (Percy, 1977). In the future, when there is little water to allocate, the lack of well defined guidelines may result in a high level of discretionary power in the granting of licences and increased tenure uncertainty.

Since water licences are considered to be legal contracts, the water user is protected against both the unilateral actions of government as well as other users. If the user ceases to use the rights or breaches conditions of the licence the *Water Resources Act* provides limited conditions for the cancellation of the licence. The only other provision under which a licence may be cancelled and the water reallocated to a higher use requires authorisation by the Minister. Under the current priority hierarchy of uses industrial users may, in theory, have their right cancelled in deference to an agricultural user. This does not ensure that the use with the higher economic value is protected. The impact of this provision on tenure security is mitigated by the use of compensation paid to the owner the cancelled licence. In practice, however, licences are rarely cancelled and are generally considered to be issued in "perpetuity" (Percy, 1980), thus tenure security has not, in the past, been decreased. Again, this may change when there is increased demand for water from fully allocated streams.

The inability of the government to cancel licences may actually result in a lower level of tenure security since there is a limited ability to protect a licensee from the harmful actions of other users. Regulations in the Act which govern water management have often been developed only in response to particular problems or fears, generally related to irrigation (Percy, 1977), and may not be adequate to deal with new problems arising from increased conflict. Also, penalties for violating regulations are fairly limited (the *Water Resources Act* limits fines to $3,000 or a short jail term). This, coupled with the tendency for licences to be issued in perpetuity, limits the government's ability to control the acts of other users.

The administration of water rights also impacts tenure security. Because of the lack of guidelines and the rigidity of the *Water Resources Act*, the administration of water rights

often depends to a large extent on the decisions of Alberta Environmental Protection (the government department responsible for water management). It is the government which reviews and grants licences, and controls allocation during scarcity. Additionally, Alberta Environmental Protection also uses statutory authorisations which bypass the legislative requirements of the *Water Resources Act* to provide temporary rights of use. These authorisations not only lack any legal basis and therefore lack security for the water users, they also change the ground rules and erode the tenure security of all licence holders.

Although Alberta's *Water Resources Act* does provide some security it is not adequate to deal with the conflicts which may arise under a fully allocated system. This will in turn limit the physical and tenure security of the water users, making investment in, and economically efficient use of, water a less attractive proposal. Lower security, both physical and tenure, results in less desire to invest in uses which have a higher economic value, and investment may instead be directed towards uses with lower economic value. For example, a risk averse economic agent (or even a risk neutral agent) is unlikely to invest in an industrial project if the supply of water cannot be guaranteed or if his use may be harmed by another; whereas a farmer may invest in irrigation systems to direct his existing water right to lower valued crops since he has little physical uncertainty. As Alberta's water resources become fully allocated, the lack of physical security, the inability of the water institutions to deal effectively with shortages, and the conflict arising between users will severely limit investment in high value uses of water resources. The value to society as a whole will, therefore, be less.

The *Water Resources Act* has few provisions that allow for water use and users to change as social, economic, and technical requirements change. Licences are made appurtenant to the land or project and there are very limited transfer provisions. The linking of the licence to the land or project results in the value of the water right being incorporated into the price of the land. Because the land or project must be purchased in order to use the water, the cost of investing in water resources increases. As the investment cost increases, fewer new projects will be undertaken.

Changes to the use of the water are also limited. Water rights purchased with the land or project must be directed towards the original purpose or a 'higher purpose' use. The 'higher purpose' is a misnomer since the priority list, first developed in the 1920's and changed only a few times under pressure from special interest groups (Percy, 1977), does not reflect the current economic or social value of the water. For example, if land and the accompanying water right is purchased for industrial use, the water licence can only be used for this purpose if it was previously designated for either industrial, water power, or 'other like purposes'. A licence which was designated as being for irrigation, municipal, or domestic use cannot be transferred to industrial use. To use the water for industrial purposes, the old licence must be cancelled and application for a new licence made. Of course, the new licence would be a junior licence with all of the accompanying uncertainty.[16] Even transfers of use to a different location may require a new licence (Percy, 1977). Clearly, the *Water Resources Act* fails to provide for the flexibility needed to realise

[16]Transfers to a higher purpose also require the issuing of a new licence; however, the new licence has the same priority in time as the old licence so there is actually little impact on the water user.

the most beneficial use of water in current and future conditions.

Previously, incorporating flexibility for different economic and social needs into past allocation and licence practices merely meant the issuing of new licences for new uses. As water sources become fully allocated in Alberta and competition between existing users increases this 'solution' is no longer possible. The *Water Resources Act* does not provide adequate means by which to deal with the changing structure of water use especially in light of full allocation and the competition between uses that will inevitably follow. Provisions for changes to existing licences need to be incorporated into Alberta's water law to ensure that water can be used in the most desirable and beneficial manner.

The final criteria by which to judge water institutions and policy are usually related to an evaluation of water transfer policy; however, they are also important in the initial allocation and management of water licences where transfers are extremely limited, as in Alberta. For example, 'predictability of outcome' is generally related to the predictability of the outcome of transfers. It does, however, also relate to the predictability of the outcome of change. As mentioned previously, water users are generally risk averse and do not like uncertainty. Alberta's water law provides for public notification and consultation in the application and review process for new licences.[17] Water users are thereby provided the opportunity to gain knowledge about changes caused by either issuing of new licences or legislative changes. This type of consultation is an important way to decrease a water user's uncertainty regarding future changes and eliminate one potential obstacle to investment.

Water users in Alberta do not face the true opportunity cost of the resource. Although the criterion of paying the real price for water is generally related to pricing of water transfers (especially between different sectors), it is still applicable to an economic evaluation of Alberta's water law. Failure to ensure that the true opportunity cost of water is faced by all users results in a failure to consider the true consequences and costs of economic decisions. There is little incentive to use water for the highest economic value, or to conserve water from low valued uses, when the real value of the water is not known to the decision maker.

Although the *Water Resources Act* does include some provisions for the protection of instream flows, such as the allocation of instream water rights,[18] emergency expropriations, reservations, and the use of specific terms or conditions in the licence, these provisions have rarely been used. For example, only one instream flow licence has been issued and the use of water reservations is only used as an interim measure (Ferner and Ross, 1992). The use of emergency expropriations is generally associated with short term requirements and is not a useful tool for the long term protection of instream flows. Additionally, the Act does not directly incorporate provisions for social values such as non-consumptive recreation, habitat protection, and amenity values. Indeed, the system of prioritisation and historic use of water results in the favouring of consumptive uses (Environmental Law Centre, 1991). Management practices are, however, starting to be

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[17]This solicitation of and concern for public input has been continued in the review of the proposed changes to the *Water Resources Act*. A review of these changes is included in "Transferability in Alberta", page 46.

[18]This provision is only applicable to rivers outside of the South Saskatchewan River Basin. Within the basin water has been "reserved" and cannot be allocated.

amended, and legislative changes proposed, to consider the non-consumptive value of water (Alberta Environmental Protection, 1991). Unfortunately, these attempts at incorporating social values do not currently have any legal basis and are, therefore, vulnerable to challenges. Although the existing legislation falls short, future consideration for social values, such as instream flow protection and consideration for the conservation objectives, are included in the new *Water Act* (see Section VI, page 47).

Finally, although the *Water Resources Act* applies to all users equally, the existence of riparian rights and the use of statutory authorisations may result in the perception that not all water users are treated equally. The existence of riparian rights places some restrictions on licensees that may be considered unfair. For example, riparians have the right to unimpaired water quality, even if the upstream users are licensed. Additionally, since the *Water Resources Act* was historically developed to deal with water use in the area of irrigation, and since historic use has provided irrigation with senior licences, there may be some perceived bias towards agricultural water users. Even within irrigation there is the potential for bias. Allocation within irrigation districts is regulated by the Act to ensure fairness; however, as stated in Section II: "Irrigation Districts", there are problems with the interpretation of these regulations and limited enforcement provisions.

The *Water Resources Act* fails to meet the criteria necessary for the promotion of the economically efficient use of water. As water resources in Alberta become more scarce, this failure will become more critical. An evaluation of various water allocation systems was completed by Howe, Schurmeier, and Shaw, using the previously outlined criteria, concluded that the system which came closest to fulfilling the criteria was a water market. The following sections will evaluate the use of water markets and water transfers in the United States and Australia. Their experience will be combined with the insights provided by this evaluation of Alberta's water law to determine how water transfers may be introduced into Alberta's water management system.

IV. United States' Experience

The semi-arid environment of the Western United States is similar to that of Alberta, thus, the way these states manage their water resources can provide pertinent information for Alberta's water management. Also, since water transfers have been incorporated into their water management systems for a considerable time the experience of these states provides examples of how transferable water rights function in practice: their benefits and their problems. To understand the functioning of water transfers in the Western United States it is helpful to first understand the water management structure and use of appropriative rights in these states. It is then possible to understand how water transfers have been used and to learn from these experiences.

A. Prior Appropriation

In the Western United States, ownership of water resources is vested with individual states. However, unlike Alberta, once water has been appropriated by an individual the water right or licence is deemed to be private property. Government has only limited control over the use of these private property rights. Water laws, bound by the understanding of water rights as property rights, are designed not to govern the strict allocation and use of water, as in Alberta, but to define the rights of the water users (MacDonnell, 1989). Government control over water allocation is used mainly to prevent conflicts among users by ensuring that water use does not exceed water supply and by protecting the rights of existing water users. In the majority of states property rights related to water are allocated under a system of appropriative rights (Colby-Saliba and Bush, 1987).[19] It should be noted that some states, most notably Arizona, have different laws governing the use of ground water versus the use of surface water. Since the use of surface water has been the primary focus of this thesis, laws governing ground water will not be included.

Under a system of appropriative rights "...decisions about allocation and use of the resources are made by the actions of individual appropriators..." (MacDonnell, 1989, 784). In all states, a new appropriator must obtain a permit to divert the water from a specified governing agency. Appropriations existing prior to legislation requiring formal approval need not obtain retroactive permits. The existence of these unlicensed appropriations has created obstacles and problems in the transfer approval processes. These problems will be discussed later (see page 24).

In most states, an application to appropriate water is filed with the state's water governing agency, for example a water control board. The application to appropriate water must include information on the project or works, the location of the diversion, the proposed use of the water, and the timing and amount of the proposed diversion. Once an application has been made, existing appropriators may file objections to the application. The water agency reviews the application and objections to the application according to various criteria. The scope of the review varies widely among states. Colorado closely

[19]Some states, such as California and Utah, do recognise limited riparian rights, however, riparian users are usually small and the majority of large water users are governed by an appropriative system. For further information on riparian rights in the Western United States see Colby (1988) and Gray (1989).

follows the appropriation doctrine, with the state's role being merely to determine if the proposed appropriation interferes with the rights of existing users and that the water will be put to a 'beneficial use'. If these conditions are met, the permit application must be approved. On the other hand, California's stricter controls make public interest the primary issue in the approval of applications. Its State Water Resources Control Board must, by law, consider "...the control, protection, development...and conservation of water...as well as the 'relative benefits' of competing beneficial uses" (Gray, 1989, 750). This gives the board wide discretionary powers over the approval of permits and their associated appropriations.[20]

Although there are differences between states, the requirement of 'beneficial use', in some form, has been incorporated into the water legislation of all Western States. It is an important concept in the initial approval of appropriations, in the forfeiting of water, and in the transfer of water rights. The exact nature of the 'beneficial use', however, is not always well defined. Legislation in Arizona and California include uses such as domestic, municipal, irrigation, and water power, as well as non-standard uses such as recreation, fish and wildlife protection, and water quality maintenance. In most states, however, the determination of what constitutes beneficial use, and its implications, is most often left to the discretion and precedence of the governing state agency or water court.

Once an application is approved, the state issues a permit which specifies the type, amount, location, and time of water use. (Conditional permits may be issued if the appropriation will begin at a future date.) If the permit is rejected, the applicant, or protester can appeal. The appeal process is often done through the state's water courts; however there is a trend towards using a less formal appeal processes. Utah, for example, allows for appeal directly to the state agency, leaving a court challenge as a final option (Davis, 1989). The exact terms and conditions attached to the permit can vary widely. California has one of the strictest regulations. Its standard conditions include provisions protecting wildlife areas, water quality, instream flows, and the rights of senior appropriators. Permits also recognise the authority of the state's agency to modify the permit at any time with due cause (Gray, 1989).

Once approved, permits are given priority based on the same 'first in time, first in right' principle used in Alberta. This prioritisation principle is an important component in the doctrine of prior appropriation in all Western States.[21] The actual date that a permit is recognised does vary slightly. It may be established as the date the application was received, the date the application was approved, the date that an intent to appropriate was determined, or the date the actual appropriation takes place. The concept of prior appropriation is an important influence over both the valuation of a permit and the approval of water transfers. Conditional permits, often issued if the appropriation will take place in the future, enable appropriators to establish a priority date before the actual, physical appropriation takes place. Once certain conditions are met, such as proof of water use, the permit is made permanent with its priority date set as the date when the conditional permit was issued.

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[20] Implicit in all evaluations is the understanding that there must be sufficient, unappropriated water for the permit.

[21] Although it must be noted that some states, such as Utah, will give priority to domestic and agricultural uses in times of extreme scarcity (Davis, 1989), regardless of this prioritisation principle.

B. Abandonment

As a property right, water permits in the Western United States are usually considered to be permanent; however, there are some instances where a water right can be revoked. If an appropriator does not use the water right it can be deemed to be abandoned and reallocated to another user. Abandonment provisions are present in most Western States. In Colorado the Supreme Court has ruled that "irrespective of the decreed diversion right, a water right exists only to the extent of actual beneficial use" (MacDonnell, 1989, 789). Thus, if an appropriator cannot show historic use of all, or of a portion of a decreed diversion, the unused portion is considered to be abandoned. Colorado's state engineers consider a water right to be abandoned if it has not been used for ten years or more. Wyoming requires that the water right be unused for only five years. The actual abandonment action, however, must be initiated by a written request to the state's Board of Control. This enables a third party to apply to have a right declared abandoned. An abandonment action may be precluded if the right is again used, in effect, making abandonment in Wyoming a "voluntary" action (Squillace, 1989 and 1991).

Water salvaged due to the appropriator's conservation efforts may also be considered abandoned. Nevada believes that "since beneficial use is the limit and extent of a right, a water user has no right to his inefficiencies" (Colby, 1988, 733) and salvaged water is considered to be unappropriated or abandoned water. However, in an effort to promote conservation, several states allow conserved water to be transferred. Such transfers are subject to standard transfer conditions to ensure that other appropriators will not be injured by the activation or reappropriation of the unused right. The consideration of salvaged water due to improved irrigation procedures may be more complicated. Since improved irrigation often results in a decrease in the 'wasted' water, the percentage of return flows may be decreased. The transfer of the total amount of conserved water to a consumptive appropriator may decrease the amount of water flowing to downstream users, adversely affecting their appropriations. The determination of third party effects must, therefore, include how the conservation efforts affect the entire cycle of water use and not just the quantity of water which is diverted by the appropriator.

Still, the use of salvaged and abandoned water is an important consideration in an effective water management system. As water becomes more scarce, government policy that encourages the conservation of water will be more important. If salvaged water is deemed to be unappropriated, appropriators will have less incentive to conserve the water they use. Some states have recognised the importance of promoting conservation and are attempting to develop legislation that will allow the transfer of conserved water while attempting to ensure the protection of third parties (Colby, 1988).

C. Water Transfers

Most Western States allow the transfer of water rights in some fashion. American courts have ruled that since a person could, in effect, transfer the water right through the sale of his land, the sale of the land is really irrelevant and the rights holder should be allowed to sell the water right independent of the land. This type of ruling is based on the understanding that a water right in the United States is essentially, a property right (see page 19). "[I]f the

priority to the use of the water...is a right of property, then the right to sell it is as essential and sacred as the right to possess and use it." (MacDonnell, 1989, 787) The right to transfer water is, however, limited by state law.

All states require that an application for transfer be filed and approved with the state's water agency. The actual process for application and approval of transfers varies between states; however, it is usually similar to the process used in obtaining permits to appropriate water. California, for example, allows water transfers only "if the water use has been reduced or discontinued because of water conservation or the substitute use of reclaimed waste water" (Colby-Saliba and Bush, 1987, 116). In Colorado, however, the right to transfer water is limited only by a provision of 'no injury' (see page 23). Other states, such as Utah, promote transfers but require them to meet a strict set of requirements (Davis, 1989). It must also be noted that in some states restrictions on specific water courses sometimes act as a barrier to transfers. In the case of Arizona, for example, the complexity of the laws and agreements governing the Colorado River has created confusion and controversy. The question of whether an appropriator can sell his right to Colorado River water or whether the right becomes forfeit has not yet been decided (Woodard and Checchio, 1989).

Water rights in all states can be transferred several ways: by type of use; point of use; point of diversion; and time of use. An application to transfer all or part of a water right must include information about the existing right including proof of historic use[22], maps and surveys of the location, and details of previous water use. The application must also include details about the proposed transfer such as the exact nature of the change, impacts on other appropriators, and, in some cases, provisions for compensation of other affected appropriators. Again, the degree of detail required from an applicant varies and is often influenced by the complexity of a state's approval process. In Colorado the transfer approval process is conducted by a water court. Applications are often contested and decisions appealed. Consequently, the Colorado process is a highly litigious process involving consultants and lawyers (Colby, 1989). Wyoming, on the other hand, has a much less formal approval process conducted by the state's Board of Control based, in part, on public hearings. Wyoming does, however, have more legislative limitations on water transfers than Colorado. Transfers in Wyoming are permitted only with adjudicated (or proclaimed) water rights; temporary transfers on unadjudicated rights may be allowed if the use does not change and if the point of diversion is transferred only within the same vicinity (Squillace, 1989). Other states usually fall somewhere between these extremes. In Utah hearings are held by the Division of Water Rights and not a water court; however, they also include the input of lawyers and experts (Davis, 1989).

In all states applicants for permanent transfer must prove, prior to any hearings, that public notice has been given, often by advertisements in local papers. This notice allows interested parties to file a protest or indicate a concern regarding the proposal. Some states also require notification of specified parties such as local governments, adjacent

[22]In several states, most notably Colorado, early appropriators did not require a licence or permit. Also, early permits did not clearly define the appropriations. To provide a more detailed description of the appropriation, water courts and agencies have based the description of the right on the actual, historic appropriation and use of the water rather than the strict definition given by old permit (MacDonnell, 1989).

appropriators, or water agencies. Protests by non-appropriators may be considered in some states; however, the weight given to these protesters may be less than the weight given to an appropriator. The grounds on which a protest may be filed may also be limited; Colorado requires that a protest be based on injury to a water right, while New Mexico allows protests based on injury to the protester's water right, injury to public welfare, or impairment of water conservation (DuMars and Minnis, 1989).

The resolution of protests is "often a critical and costly part of the transfer process" (Colby, McGinnis and Rait, 1989, 703). There are two basic approaches to resolution; a formal hearing process, or an informal, private resolution. Informal hearings often involve arbitration hearings between the applicant and protester. They are much less costly, in terms of both money and time, and are often the most efficient way to resolve the disputes. Formal hearings do, however, provide a forum for the introduction of expert testimony which may be necessary in complex cases, but they are extremely costly. Some states allow the parties to choose whether they want a formal or informal hearing. Other states have attempted to avoid formal hearings, wherever possible, by conducting pre-hearing meetings. In Idaho, the Department of Water Resources often conducts these conferences to attempt to resolve the conflict before a formal process is begun (Colby, McGinnis and Rait, 1989). Colorado has a referee review and rule on the application and objections to the application. Appeals to the referee's decision, filed within twenty days, are dealt with in the water courts. The courts, not being bound by the decision of the referee, then conduct their own review. However, the involvement of the water court greatly increases the cost to the applicant. The high costs involved in demonstrating 'no injury' in the review process are usually borne by the applicant. If the case is extremely complex or contentious, protracted reviews may make the transfer fiscally unviable. In an attempt to avoid this complex and expensive process, Colorado encourages applicants to negotiate compensation with third party appropriators prior to the actual filing of the application to transfer, and to incorporate these terms into a 'proposed decree' (MacDonnell, 1989). This trend towards decreasing the complexity and, therefore, the cost of the application and hearings is being adopted by several states in an effort to promote transfers.

D. Transfer Criteria

Although the exact nature of the evaluation process varies among states, there are several criteria which are common among states. The primary criteria is that of 'no injury' or 'non-impairment'. The 'no injury' condition involves ensuring that the proposed transfer is not detrimental to any other water appropriator. In theory, the burden of proof of 'no injury' is on the applicant; however, since proving a negative is virtually impossible, water agencies in several states have eased this requirement. In Colorado, the "burden of proof...requires him [the applicant] to meet only the ground of injury to Protestants asserted by them" (MacDonnell, 1989, 794-795). In other states the applicant must only make a *prima facie* showing of 'no injury' and the burden of evidence then shifts to the protesters. Several different approaches are used in determining if injury will occur and dealing with any injury that is found.

In theory, Colorado stipulates that the only condition of 'no injury' is that no other water appropriator be adversely affected by the transfer. In practice, this condition has been

expanded to ensure that there is no impairment to stream conditions (MacDonnell, 1989). Colorado's historic lack of well defined appropriations has resulted in the need for water courts and agencies to base the description of the water rights on the actual historic appropriation and use, and not the strict definition of the permit. Not only has this led to problems in determining the actual characteristics of the appropriation being transferred, it has also led to increased problems in determining if injury will result from a transfer. As explained previously (see note 22, page 22), appropriators in Colorado do not always have a licence or permit and, even if they do, the actual appropriations are not always clearly defined. Consequently, the Colorado Water Court often must rely on the historic use, regardless of the permit or licensed amount, as a gauge of how much water can be transferred, as well as the timing when the water can be removed. Thus, not only does 'no injury' have to be shown, but historic uses for both applicant and protestant must also be proven. This lengthens the approval process and increases transaction costs for the applicant. The use of proposed decrees, similar to those used in the permit application process, is one attempt by Colorado to mitigate potential injury to other appropriators. Proposed decrees can help to decrease the controversial nature of applications and the high costs associated with proving 'no injury'.

In California an applicant must show 'non-impairment' to the satisfaction of the Water Resources Control Board. Recognising that a balance needs to be found between the protection of other appropriators and the difficulty of proving 'no injury', California has incorporated the use of a trial period into their approval process. In cases where the effects of transfers on other rights holders are difficult to predict, but are unlikely to be large, the transfer may be approved subject to the provision that any future injury may invalidate the transfer or, at least, may require compensation to be paid. California has also begun development of a water transfer guide for applicants that will provide "information and resources which could be used to identify third-party effects and mitigation alternatives" (Gould, p. 466, 1989).

Arizona, where ground water transfers between basins are fairly common, has expanded the concept of 'no injury', making the buyer of water responsible for any harm to "individuals in the basin of origin" (Colby, 1988, 134).[23] Legislation does not, however, clearly define limits to who can claim injury and what exactly constitutes an injury. This has resulted in hesitancy on the part of buyers who fear extensive litigation and damage claims. Arizona's water law is being reviewed; however, legislators have still failed to clearly resolve fundamental problems surrounding its policies towards water transfers and their function in its water management system (Woodard and Checchio, 1989).

While the concept of 'no injury' or 'non-impairment' has historically reflected only protection for the rights of other appropriators, several states have begun to recognise the importance of protecting 'public interests'. "[P]ublic interest ...is a largely undefined concept referring to the consideration of public values affected by water allocation and transfer." (Colby, McGinnis and Rait, 1989, 707) Although the concept of such a 'public welfare clause' is not usually incorporated into state law, it has evolved through case law into a

[23] Although this issue involves ground water, it provides an excellent example of how an unclear water policy can suppress water transfers.

fairly tangible consideration. What exactly constitutes public interests varies widely between states. Idaho has the most precise definition of public interests. Idaho's Supreme Court includes "its [the transfer's] economic effect, benefits and detriments; its effect on loss of alternative uses of water...; its effect upon access to navigable or public waters; ...the assurance of minimum stream flows; discouragement of waste; encouragement of conservation; public health and safety; aesthetic and environmental ramifications; and, effect upon vegetation, fish and wildlife" (Johnson and DuMars, 1989, 357-358). Transfers must also comply with state standards for air, water, and hazardous substance. Colorado, on the other edge of the scale, requires only that transfers not harm the rights of future water users or increase the costs of obtaining water in the future. The state does, however, acquire water rights to protect instream flows thereby protecting natural habitats. Unfortunately, this has a fairly limited scope and water courts do not generally provide for public interests in their evaluations (Colby, McGinnis and Rait, 1989). Most states, however, have begun to realise the importance of incorporating public interests into their transfer approval processes. Nevada, Arizona, Wyoming, and New Mexico require that any transfer application deemed to be harmful to or against public interests be refused. Decisions denying such applications have been upheld by the courts of appeal (Johnson and DuMars (1989) and DuMars and Minnis (1989)).

As previously mentioned, public interest is a very loosely defined concept resulting in highly discretionary powers for the water authorities. The courts, through challenges to the decisions of the water authorities, have provided case law which is clearer in defining what constitutes 'public interests' and how far it can go in limiting water transfers. Unfortunately, for those involved in such challenges the increased transaction costs may be exorbitant. It seems that it would be better to develop at least a basic definition of public interest within the water transfer laws and thereby provide some form of guideline for applicants and water authorities.

One other way water authorities incorporate public or environmental interests into their water management systems is through the protection of instream flows by permitting appropriations where there are no physical diversions of water. Instream flows can affect several of the previously mentioned concerns (other appropriations, future users, ecological habitat, and recreational and environmental problems), and it is therefore a broad based means to promote and protect public interests. Although there are, at present, relatively few water rights whose purpose is to maintain instream flows, the transfer of the purpose of a water right to maintain instream flows "gives environmental (and other) interests access to water rights and a basis to participate as applicants or protestants in the process" (Colby, McGinnis, and Rait, 1989, 709). Some states, such as Arizona, allow anyone to apply for licences for instream flow protection; however, most states restrict who can hold these types of licences. In Colorado, for example, only the water conservation board is authorised to appropriate water for instream flows and file objections to water transfers which may impair instream flows. Private individuals may specify that all or part of their water right be used by the board for instream flow protection, however, they may not appropriate water for this purpose. Utah's Division of Wildlife Resources may hold such water rights but they must specify what the water is to protect, for example fisheries. They cannot hold the right merely for the broad purpose of instream flow protection (Davis, 1989). Although most states allow only government agencies to hold permits for instream flows protection,

licences and transfers of licences for instream flows protection remains one way to indirectly incorporate some public interests into the water management and water transfer process. It allows for participation within these infrastructures as an actual appropriator, without the need for extensive legislation under the provisions of 'no injury'.

One problem with such permits is that the licences are fairly new and are, therefore, of low priority in the states' prior appropriative systems. Thus, although the licence to maintain instream flows may exist, they do not necessarily guarantee that enough water will be available to provide the amount of water specified by the licence. The purchase or transfer of senior water rights may eliminate this potential failing and provide a high priority licence. They do, however, have a higher cost than junior licences. As water rights become more scarce, the protection of instream flows will be more important.

Instream flows protection does, however, have some negative aspects. The transaction costs associated with transfers, especially those in respect to the 'no injury' provisions, may increase substantially. Conflicts between consumptive and non-consumptive users, such as those with instream flow appropriations, may not easily be resolved or arbitrated. Also, instream flow licences are in use year round and, since they have no point of diversion, apply along a stream. They can, therefore, be "particularly constraining for new water developments and for water transfers" (Colby, 1988, 747).

E. Water Organizations

A final area for the examination of water transfers in the Western United States is the existence of water organisations. As in Alberta, the historic use of water for large projects, such as irrigation, led to the development of several types of water organisations. The regulations governing these institutions are slightly different from regulations governing individual appropriators. For example, Colorado's Mutual Ditch Companies use stocks as the basis for water distribution. Water is allocated on a *pro rata* basis depending the number and type of stock held by the water user. These stocks are private property and may be transferred, however, transfers are subject to the by-laws of the company, which usually require the board of directors to approve the transfer. Because of the interdependency between stock holders, the concept of 'no injury' has been expanded to ensure that transfers do not adversely affect the established patterns of use of other shareholders. The applicant may also have to ensure that any applicable *pro rata* status are not impaired, and may be liable for any increased costs caused by the transfer (MacDonnell, 1989). In California the broad purpose assigned to the agencies' permits (which may include irrigation, municipal, industrial, hydroelectric, and recreational uses under one permit), have enabled them to undertake transfers within their boarders without the approval of the state's water control board (Gray, 1989). Technically if the agency already has approval to use the water for two different purposes, they can, without state approval, transfer any quantity of water between those uses. In some cases, transfers by water agencies may be more complicated. Colorado's Irrigation Districts are quasi-municipal corporations designed to oversee large irrigation projects. These districts have the right to transfer water, however, they may require prior electorate approval and a court order (MacDonnell, 1989). In general, water associations have the right to transfer water. Limits on this ability depend on the nature of the organisation (whether the water is held in trust for the public as with Colorado's irrigation

companies, or whether it is a private organisation such as mutual ditch companies). Also, the nature of the water licence or permit may limit or expand the organisation's ability to transfer, regardless of state law.

V. Australia's Experience

Australia and Alberta have many shared characteristics. Both countries have arid and semi-arid regions that are used for agriculture. In Australia agriculture accounts for 82% of total water use, 72% being in irrigation (Pigram *et al*, 1992). In Alberta, agriculture accounts for nearly 50% of the water allocations (see page 2). The most important link, however, when considering water use and management is in the area of water law. Australian water law has developed in much the same way as Alberta's water law and has actually influenced the development of Alberta's current legislation (Percy, 1977).

Figure 2: Map of Australia
(Developed by the author using a computer graphics program.)

A. Development of Water Law

As in Alberta, Australians found the riparian system of water management, transplanted by European settlers, inadequate in their arid and semi-arid environment. In the late 1800's a Royal Commission was formed in the state of Victoria to consider alternative water management systems. The commission decided that the American system of prior appropriation, based on individual appropriations and case law, lacked the government control considered to be necessary for a properly functioning water management system. "The cost, delay and uncertainty inherent in this process [the prior appropriation system]..." made it unacceptable as an alternative to the riparian system (Pigram, 1986, 57). By 1881, before the commission finished its report, the state of Victoria had effectively gained control of the riparian rights along most rivers and streams. The vesting of water rights with the state was recommended by the commission and was formalised by various pieces of legislation between 1886 and 1905. Other Australian states[24] followed Victoria's lead and a

[24]Due to its unique environment Tasmania will not be included in this review. Although Tasmania has also participated in water management reform in Australia, its primary water usages have been hydroelectric and recreational, and not agricultural (Pigram, 1986); and is thus not as relevant to Alberta or especially Southern (continued)

system of "administrative disposition" of water rights was developed (Pigram, 1986).

B. Administrative Disposition

This system of administrative disposition is extremely similar to Alberta's water management system. In Australia, as in Alberta, "the rights or entitlements of individuals to use water are specifically determined and controlled according to particular provisions of legislation or certain administrative processes" (Dragun and Gleeson, 1989).[25] The actual management of the water resources is conducted by state water authorities which were initially developed to manage irrigation. They now, generally, function independent of government departments and report directly to government ministers. However, in the area of water quality management, the agencies function in co-operation with environmental and health agencies (*Water 2000: Agricultural Water Demand and Issues*, 1983). Often the water authority or ministry is divided into two types of agencies: one responsible for urban water uses, and the other responsible for all other water uses. The exception is in South Australia where water is administered and controlled by a single agency (Pigram, 1986). The existence of these different agencies has led to some conflict in water management; however, recent initiatives have been aimed at eliminating these conflicts and developing total policy schemes.

Water users in Australia must obtain a permit from the relevant state agency (usually the state's water commission) to divert water. The application must include an estimate of the amount of water diverted, the way it will be diverted, the rate of the diversion, and how the water will be used. As in the United States, the proposed diversion must be adequately publicised to allow interested parties to file any objections with the commission. Most states do not have specific criteria for the evaluation of applications and use public interests as a general criterion (Mulligan and Pigram, 1989). This allows the water commissions a large amount of discretion in the evaluation of applications; however, the commissions have used this discretionary power in a fairly conservative way (Randall, 1981). In general, "any use of water...may be sanctioned as long as it does not deleteriously impinge on some existing use of water regardless of priority" (Dragun and Gleeson, 1989, 657). Once the commission rules on the application, the appeal process may begin. An applicant may appeal the commission's ruling directly to the courts whereas appeals by objectors are first dealt with on a local level and are only forwarded to the courts if no resolution is reached.

Licences are granted for a limited time, from between 1 to 15 years; however, renewals are frequently considered to be a mere formality (Pigram *et al*, 1992). Still, licences may be revoked or altered by the commission if the water is being wasted or used in an unauthorised manner. Licences are thus "more appropriately characterised as privileges than rights" (Dragun and Gleeson, 1989) and the government has ultimate control over how the privilege is used.

Alberta.

[25]Riparian rights still exist in most states; however, they are limited to domestic uses. Their existence does not hinder the government's management of water, because the use of riparian rights must be consistent with government policy, and the government has the right to suspend or limit riparian rights when it is decreed necessary (Pigram (1986) and Dragun and Gleeson (1989)).

In Australia a water licence provides the owner with the right to divert a portion of the total water available. In New South Wales, for example, water licences for an irrigator were initially issued in terms of land size, to a maximum of 162 hectares. A maximum diversion per hectare was determined based on the type of irrigation and crop grown or based on a fixed quantity for other uses. Consequently, the only way to increase the total allocation was to increase the amount of land owned. This led to abuses in the system where landowners who wanted to use more water simply exceeded their theoretical allocations (Fenwick, 1990). These abuses were compounded during times of scarcity. To eliminate such abuses, water policy was revised to include the use of a Volumetric Allocation Scheme. Under this scheme the licence was still tied to the ownership of the land, but a seasonal allocation of water was incorporated. Depending on how much water is available in a particular year, licensees are allocated a certain percentage of their total entitlement. In a drought year, for example, a licensee may receive only 60% of his entitlement, while in a wet year he may receive 120%. The determination of the annual allotment is region specific, allowing for greater control and management by water authorities (Pigram *et al*, 1992).

The determination of an entitlement's priority in Australia is markedly different from Alberta and the Western United States. In Alberta and the Western United States a licence's priority is based on the 'first in time, first in right principle'. In Australia, a licence's priority is based on the type of water use. Generally domestic users are given priority, followed by agricultural uses, and then other uses (Dragun and Gleeson, 1989). This ranking system is also incorporated into the use of the volumetric allocation system. Licences with similar water uses receive a similar percentage of their water entitlement. Thus, all irrigators may receive a certain portion of their allocation in a dry year whereas industrial water users would receive a different percentage of their allocation. The priority system also affects the initial approval of licences. If more than one use is being considered, and the uses would injure each other, the use with the higher priority takes precedence.

It must be noted that although all water in Australia is theoretically vested with the states, not all water is strictly controlled by the state. In South Australia, for example, the *Water Resources Act* (1976, amended 1990) "empowers the Engineering and Water Supply Department to control the extraction and use of water from important catchment and recharge areas..." (Pigram *et al*, 1992). The use of water outside of these Water Protection Zones does not require a licence and is, therefore, unlimited. This free use of water is not, however, as open as it first seems. Ground water extraction does require permission from the department and the department may place controls on extraction rates. Also, the state can "proclaim" any basin or stream, should the need arise, enabling them to require licensing and thereby to control water use (Pigram *et al*, 1992).

C. Changing Focus

In the early 1980's Australia realised that its water resources were nearly fully allocated and the costs of developing new sources of water, such as building new dams, made them unfeasible. Australia's water economy was entering a mature phase. A mature water economy is characterised by "sharply rising incremental costs of water supply, more direct and intense competition among different kinds of users, and greatly increased

interdependence among water users" (Randall, 1981, 196). Australia's increasing supply problems were compounded by an ageing water infrastructure in need of extensive repair. The increasing demand for water placed pressure on existing supplies leading to problems of salinity and water pollution. The historic response of government of attempting to increase water supplies through technical solutions merely compounded the problems. By subsidising conventional water supply structures, such as dams and reservoirs, the government created the impression that water was a cheap, unlimited resource. In a mature water economy, where the creation of new water supply projects are too costly to be considered feasible, the government needed to find new ways to meet the excess demand for water. They needed to focus on ways to generate revenue for future supply projects, decrease the demand for water, and reallocate existing resources in response to the demands of water users (Randall, 1981).

The Australian government commissioned a series of studies to review the status of Australia's water use and management, and to predict the changing demands on the water system in the year 2000. The *Water 2000* Studies provided not only a stock taking of existing water uses and issues, but also provided suggestions on how to avoid the consequences of conflicting water demands in a mature water economy. "[I]t provided a timely catalyst for action and change by water authorities and policy makers." (Watson, 1990, 12) Government shifted its emphasis to better management of existing supplies focusing on "conservation and environmental protection as well as economic development" (Maass, 1990, 19).

D. Transferable Water Rights

It was felt that the existing system of water allocation had led to inefficient water use. Since agricultural uses accounted for over 80% of total water use in Australia, policy makers directed their attention towards imposing the efficiency of water use in the agricultural sector, specifically in the area of *Water 2000: Agricultural Water Demand and Issues*, 1983). The previous government policy of water supply subsidisation led to over-allocation and uses of water which were far below water's true marginal cost. It was hoped that improving efficiency in the area of irrigation would improve the irrigators' net returns while decreasing problems, such as salinity, associated with intensive irrigation (Pigram *et al*, 1992). Also, it was hoped that a small improvement in the efficiency of irrigation would free a sufficient amount of water for other, higher valued users, such as those in the industrial or municipal sectors. In an effort to promote the efficient use of water, the Australian state governments revised their water management practices to incorporate the concept of transferable water entitlements.[26] Previously, licences in Australia were appurtenant to a particular parcel of land and could not be transferred independent of the land. Key to the implementation of a system of transferable water rights was the revision of existing legislation to allow for transferability and the need to sever the link between water licences and the land.

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[26]One exception is Western Australia which has not permitted transfers; however, several reforms have consolidated water management under a single water authority and the state has implemented several studies of water management, demand, and pricing in an attempt to develop long range water planning (Delforce *et al*, 1990).

To facilitate the development of water entitlements, several states introduced new legislation. For example, Victoria's *Water Resources Act* (1989) consolidated over 40 acts dealing with water management. The Act attempted to clarify the rights and liabilities of the entitlement holders, and the role of water authorities (Adams and Barlow, 1991). Reliable information on current water uses and resources was required to make informed policy decisions. New South Wales also implemented reform of all water related legislation to give water agencies standard objectives, improve co-operation between water authorities, provide a single licence assessment procedure, and allow permanent or temporary transfers (Mulligan and Pigram, 1989). In Queensland, a revision of existing legislation broke the tie between the water entitlement and the land. It also permitted the use of announced allocations ultimately leading to the development of transferable entitlements (Fenwick, 1990). In South Australia the *Water Resources Act* (1976) had already provided for consolidation of water management and improved co-operation and public participation in water planning. The government's development of a policy of transferability simply involved the proclamation of involved areas and use of its powers granted by the *Water Resources Act* (1976) to control the allocation and use of the proclaimed water (Pigram *et al*, 1992).

Most states proceeded in a cautious manner, implementing test areas or allowing only temporary transfers within agriculture. South Australia, a leader in the introduction of transferable water entitlements began by permitting permanent transfers between private water users within specified areas (Pigram *et al*, 1992). New South Wales, on the other hand, decided to initially permit only temporary transfers; however, transfers were permitted across the state. The state now permits two forms of transfer: the transfer of all or part of an annual allocation on a temporary basis; and the transfer of all or part of a water entitlement on a permanent basis (Cummings, 1991). Queensland incorporated allowances for temporary transfers between irrigators into their legislation. Provisions for permanent transfers of water entitlements may be incorporated in the future, along with lessons learned from the temporary transfers (Fenwick, 1990; Langford and Foley, 1990). All states implemented their transfer policy after extensive study and continue to review and adjust for its effects. It appears that as the states gain more experience with the effects of water transfers these types of restrictions will be revised or lifted.

As in the Western United States, transfers must be approved by the governing state agency. The guidelines for the evaluation of transfers were usually developed in consultation with the water users, most often irrigators, and through experience gained dealing with the trial transfers. Most states include in their evaluations a provision for the protection of other water users. In New South Wales, South Australia, and Victoria transfers are permitted only if they have no significant negative impact on other water users. The main considerations used in this evaluation are that existing system capacities not be exceeded and that no significant problems with salinity be caused (Pigram *et al*, 1992). In hopes of avoiding harm to third parties and environmental degradation, South Australia requires that an irrigation management program be provided, including provision for an appropriate drainage system (Curd and Schonfeldt, 1990). Queensland has no explicit provisions for the protection of third parties, however, its guidelines for the consideration of transfers incorporate several aspects which indirectly protect third parties. For example, the guidelines include the requirement of proof of historic use and transfers of unused water

allocations are not allowed. Also, individual districts may iinpose conditions on the transfer such as restrictions on volumes transferred and on the direction of the transfer (Fenwick, 1990).

Another means by which the states provide protection of water supplies is by the use of a reduction factor. The reduction factor varies for specific regions and often depends on how fully allocated the affected water system is and where the water will be transferred. Permanent transfers in the Lachelan Valley of New South Wales, for example, have a reduction factor of 30% (Pigram *et al*, 1992). In parts of South Australia, a 10% reduction factor has been used on transfers between irrigators, but a 70% reduction factor has been used with transfers between sectors. The aim of reduction factors is to help decrease the potential problems associated with the activation of 'sleeper' permits, such as over-use or salinity. New South Wales has, in some regions, begun requiring licensees who cannot show historic use of all or part of their entitlements to "show cause why the entitlement should not be reduced. If adequate explanation is not provided part of the entitlement (allocation) will be revoked" (Cummings, 1990, 195).

All state governing agencies may restrict or refuse transfers on either an individual, area, or system basis. Restrictions are often incorporated when water in a particular region is under stress, such as salinity or over-allocation. For example, Victoria restricts transfers to irrigators and only permits these transfers within the same supply system. Transfers from the lower Murray Lakes are restricted to 15 gigalitres (Pigram *et al*, 1992). If an area is considered to be too stressed to permit transfers, the governing agency may halt all transfers. In 1991/92 a moratorium was placed on transfers within the North Adelaide Plains while the use of transferability is reassessed. There was concern "that while transferability has enabled more productive use...it has not helped to achieve sustainable withdrawal rates" (Pigram *et al*, 1992, 22-24). The region specific nature of the restrictions and reduction factors provides an increased ability to deal with the problems and needs of individual regions; however, the lack of clearly defined regulations may increase the uncertainty of potential transfers.

The use of these types of restrictions and reductions do provide implicit protection for the environment; however, environmental interests are beginning to play a key role in Australia's new water management strategy. "Water authorities in several states now consider environmental consequences and social impact...as part of a multi-objective approach to water planning." (Mulligan and Pigram, 1989, 92) New South Wales, South Australia, and Victoria specifically require that transfers not significantly affect the environment or the salinity of the water supply (Pigram *et al*, 1992). Also, there is a growing awareness that the protection of instream flows may require government or community intervention. Victoria's *Water Act*, for example, includes provision for the protection of waterways and habitats. An "environmental custodian" may apply for licences whose purpose is the protection of instream flows, wetlands, and other aquatic habitats (Maass, 1990). Victoria has also begun to recognise non-consumptive uses. It is hoped that by developing a complete inventory of natural resources and improving monitoring, consideration of the non-consumptive uses can be incorporated into Victoria's water management system (Mulligan and Pigram, 1989). In New South Wales, the Burrendog Dam, for example, includes an allocation of 40,000 acre feet of water used to maintain the integrity of wetlands downstream (Birch and MacLock, 1990). It is hoped that water

management will become proactive, anticipating future areas of concern and avoiding conflicts or degradation. New South Wales has also restricted the access of irrigators to unregulated flows (often allocations of water that are considered to be surplus to requirements at a given time, during freshets and floods). Previously this unregulated water could be diverted by irrigators on a time duration basis, usually a few days (Cummings, 1990). Regulation agencies now require that, for some streams, certain flow benchmarks be reached before unregulated water can be diverted to promote the use of transfers instead of the unregulated diversions. It is hoped that these regulations will "leave more of the unregulated flow in the streams to meet environmental needs of aquatic ecosystems..." (Pigram *et al*, 1992, 147).

A system of transferable water entitlements divides the value of the water entitlement from the value of the land. In Australia prices are negotiated between the buyers and the seller.[27] In New South Wales, permanent transfers range between AUS$100[28] and AUS$250 per megalitre in the south up to AUS$400 per megalitre in the north. Temporary transfers are usually one tenth the value of permanent transfers (Pigram *et al*, 1992). The auction of new water supplies has been used to recover some of the costs associated with their development. In 1988 in Victoria, entitlements were auctioned at an average price of AUS$180 per acre foot. The state's cost of developing the project was AUS$135 per acre foot. Future use of auctioned entitlements to recover development costs are, however, limited. The costs of developing new storage areas in Victoria are estimated at between AUS$800 and AUS$1800 per acre foot (Birch and Maclock, 1990). It is unlikely that an auction of entitlements will recover these costs.

The introduction of transferable water entitlements in Australia has had mixed results. The majority of transfers have been within the agricultural sector. Initially, the agricultural sector was sceptical about transferability because farmers feared that there would be extensive transfers leading to smaller farms being swallowed by large agribusiness companies. These fears were not realised. Indeed, in the first year of transferability, Victoria saw over 60% of transfers occurring between small single enterprise farms (Langford and Foley, 1990). As water users became more familiar with transferability their fears were allayed. A recent survey found that although most respondents had never transferred water, between 70% and 92%, depending on the region, of respondents were in favour of transfers. In Victoria a quarter of all farmers surveyed believed they would use transfers in the future (Pigram *et al*, 1992). This trend of low rates of transfers but fairly high approval of transfer policies is seen in most states. Objections tend to be emotive and, according to Pigram *et al*, support for transferable water entitlements increases as water users become more familiar with them. The use and support of transferability is "very much a function of seasonal conditions and economic circumstances...[w]here reliability of water supply is much lower, irrigators have demonstrated a strong level of support for transferability and water transfers are seen as an important adjustment mechanism for the

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[27]State agencies generally charge a transfer fee, either a flat rate depending on the type of transfer or a charge per volume transferred. Agencies do not, however, regulate the actual purchase price or rent of the transfer (Pigram, *et al*, 1992).

[28]Dollar values are given in Australian dollars.

irrigation industry" (Pigram *et al*, 1992, 43). While transfers have been slow, Pigram's study suggests that the future needs and potential benefits of the agricultural sector will result in a greater number of transfers between agricultural users and eventually among other sectors.

VI. Introducing Transferable Water Rights

The experience of the United States and Australia, outlined in the previous chapters, provides valuable insights into the functioning of transferability in water management systems; both as a well established form of water reallocation, and as a new means of managing water demands in a fully allocated system. The impact of transferability on water users and water allocation in these countries reflects the benefits as well as the potential problems in the use of transferable water rights. With an understanding of these experiences, Alberta can plan the introduction and administration of transferability to avoid, or at lease limit, its problems and promote its benefits. The lessons can be divided into two categories: requirements of and impediments to a system of transferable water rights; and possible negative consequences of transferable water rights.

A. Water Markets

Transferable water rights are, in a very general sense, water markets.[29] In a smooth functioning competitive market, buyers and sellers meet and agree on a price at which the good is exchanged. The matching of the buyer's willingness to pay and the seller's willingness to sell is the function of the market. Anything which interferes with the movement of the market to the point where the seller's and buyer's prices meet will result in disequilibrium and a loss of economic efficiency. Generally, if the buyer's willingness to pay is equal to, or greater than, the seller's costs, including an acceptable profit, the exchange is made (see Figure 3: Total Willingness to Pay vs. Total Cost). The shaded area on the graph represents the net benefits from the transaction in the movement between q_1 and q_2. When social costs are included in the total cost equation, then the benefits are considered to be net social benefits. If any external elements result in an increase in the total costs to a point where the curves do not intersect, no exchange will occur and the benefits (public or private) will be lost.[30]

Given the need to ensure that the maximum amount of benefits possible are derived from the sale, the first step in the introduction of transferable water rights will be to develop a base which will enable the water market to function efficiently. In order to function efficiently, water markets require certain elements. These elements are also reflected in the criteria (outlined in Section III: "Evaluating Water Institutions") and are used to evaluate how water institutions facilitate or impede the functioning of a water management system. This seems reasonable since transferable water rights should be considered to be an element of a water management system, and, therefore, the criteria for a well functioning water management system should also apply to them. The following evaluation will use these criteria in conjunction with several elements which enable a water market to function efficiently. It will provide a theoretical and practical basis for the introduction of transferability into Alberta's water management system.

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[29]Holders of a water license sell or rent their right to use a quantity of water. The structure of the market depends on the controls/regulations of the water management system or authority.

[30]This is an extremely simplified explanation of market theory and is dependent on several assumptions. The basic concept of net benefits is not, however, altered by these simplifying assumptions.

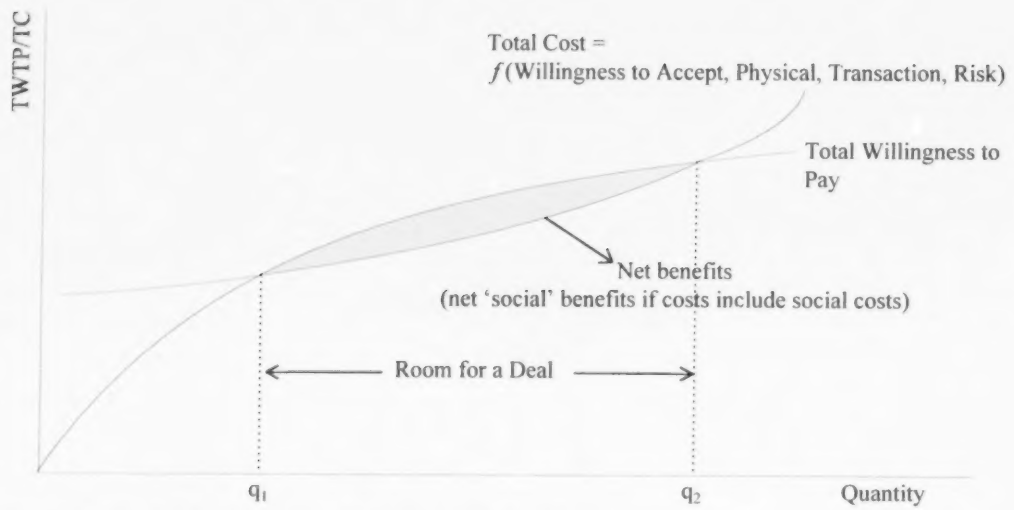

Figure 3: Total Willingness to Pay vs. Total Cost[31]
(Adapted from Howe (1990).)

The most basic requirement for a water market is a well defined product. The seller/buyer needs to know what they are selling/buying before a transaction takes place. The definition of the water right or portion of the right that is being considered must include all of the conditions of the allocation, such as quality, quantity, time, location, and any limits attached, such as the licence's priority. A lack of clearly defined water rights impacts a wide range of factors. For example, it may lead to uncertainty which can lower the 'price' of the right or increase the cost of the transaction. In Colorado, the lack of well defined rights has often led to expensive consultant fees and legal battles as the applicant must first prove historic use of the water in order to be able to transfer the water right. Additionally, determining the impact of the transfer on other water users, an important component of Colorado's 'no injury' rule, is also complicated by a lack of well defined rights. The resulting litigation may increase transaction costs associated with the transfer.[32] As represented in Figure 3, the higher the costs (including transaction costs) the less net benefit will be derived from the transfer. If the costs are high enough, the transfer will not be fiscally viable and no net benefit will be realized. Well defined water rights are, therefore, key to the development of a water market and realizing the benefits of transferability.

Associated with the existence of a clearly defined water right is the presence of tenure security.[33] As explained previously, tenure security is a certainty that the supply of

[31]This graph does not reflect the true willingness to pay and the total cost curves for water; it is merely used for illustrative purposes.

[32]As explained earlier, Colorado has recognised the extent to which these costs impede transfers. The state has introduced the use of proposed decrees to eliminate some of the court battles associated with proving "no injury" and, thereby, decrease the transfer's transaction costs (see page 24).

[33]Although physical security is also an important component of the water right and, therefore, of the transfer of the (continued)

water will not be impaired by the actions of others. Tenure security is also an important aspect of the functioning of a total water management system (see page 11). As in the evaluation of a water management system, in a market transaction the need for tenure security is clear - people are unlikely to buy a water right, which is basically a supply of water, if that supply might cease to exist, through no action of their own, and if there will be no compensation for the loss. The presence of uncertainty increases the risk and, therefore, decreases the buyer's willingness to pay. As illustrated in Figure 3, a shift down along the seller's total cost curve decreases the net benefits from the transaction and, if large enough, may scuttle the sale.

According to Pigram *et al* (1992), four conditions are important to promoting tenure security in the context of a water market: the water right must be specific and enforceable; both parties must know their rights; both parties must know the limits of these rights; and both parties must know the penalties associated with violating the rights and/or their limits. In other words, the market must be fair and the 'rules of the game' known (another criteria for a well functioning water management system). The transaction must be exclusive with the benefits and costs allocated to the sellers and buyers. This internalisation of the externalities provides the buyer/seller with the true opportunity cost of the water. As explained in the previous section, "Evaluating Water Institutions" (see page 10), full knowledge of the true opportunity cost helps ensure that market transactions are based on a true understanding of the value of the water right and are not distorted. For example, any third party effects must be incorporated into the total transaction costs. Unfortunately, as has been seen in Australia and the United States, third party effects are extremely diverse. It is difficult to account for all of the impacts that may result from the transfer of a water right. Although this incorporation of all effects into the 'price' of the transfer may not be possible, an attempt must be made to recognise as many of the impacts as possible and to mitigate their effects through compensation and/or legislation. Several of the most common third party effects are discussed below and include impacts on other licensees, agricultural communities, environmental habitats, and other non-consumptive users. Additionally, the rights transfer must be comprehensive; all of the attributes must be included in the transaction. This does not require that the whole water right be transferred, but it does require that attributes such as the quality, quantity, and location of the water must not be changed by the seller. Finally, the right must be transferable. It may seem redundant to say that a water market must include transferable water rights, however, it is important that the rights holders be able to respond to market demands and move the water between different users and uses. "Transferability of rights is one of the requirements for the efficient allocation of resources through the market place...[R]educing impediments to the free transfer of water rights is essential if water marketing is ever to become more than a theoretical solution to water allocation problems." (Gould, 1989, 459) Ensuring that the right is freely transferable entails more than merely permitting transfers. Any form of government regulation, restriction, or

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water right, the character of the market has little impact on it. The physical security of the right forms part of the total nature of the right along with its quantity and quality. The character of the market can do little to influence this attribute, other than by improving the actual supply. Indeed, the introduction of water markets and the resulting improvement in the valuation of water will hopefully increase the amount of water available.

requirement necessary to obtain permission to transfer the right infringes on the free transfer within a market system. As was seen in the previous section, "Evaluating Water Institutions", flexibility is an important element in a water management system. Flexibility "makes possible shifts in water development, delivery and use made imperative by changing natural conditions, institutions, technology, population and preferences" (Kelso, Martin and Mack, 1973, 58) and thus enables the holder of the water right to respond to the changing demands of the market place. Flexibility needs to be such that it allows the transfer of water rights in both the short term, to meet the changing seasonal demands of water users, and in the long term, to adjust to changes in the demands of water users.

The potential flexibility of a water market is often severely limited by a lack of the infrastructure necessary to bring the buyer and seller together. Infrastructure in the physical sense may limit transfers to those within a region or among regions which are close in geographic distance.[34] An intellectual infrastructure, necessary to bring buyers and sellers together to negotiate the sale, should form over time within a region, especially if, as in Alberta, irrigation districts, which have some resources to develop the market infrastructure, are involved.

Here again, the introduction or use of transferability must perform a balancing act so that government control can be in place without significantly hampering the free transfer of the water right. The limits are not clear and cannot be easily determined. In the strict theoretical sense of a free market, there should be no restrictions placed on the transfer; the market will set the boundaries. However, in the real world this type of free market does not exist. This does not mean that the benefits from transferability need to be lost; any movement towards the more efficient use of water is beneficial even if it is somewhat hampered by the constraint of regulation (Pigram *et al*, 1992). In the real world, government, public, and water users must work together to determine the appropriate level of restrictions.

A final requirement of a properly functioning water market is the severing of the tie between the water right and the land; ownership of the water right should be independent of the ownership of the land. The severing of the tie between the water right and the land provides more freedom to transfer the right to a new use. However, an attenuated water right represents an integral part of the land. As Nevada courts have ruled: "The water and the land to which it is applied become so inter-related and dependent on each other in order to constitute a valid appropriation that the former becomes by reason of necessity appurtenant to the latter" (Beck, 1991, 328). Thus, the severing of the historic link between land and water is not always feasible and may actually have some negative consequences. For example, if a water right is transferred away from the land, the total value of that land will most likely decrease. This is expected; however, the value of the land surrounding the parcel in question may also drop (see below). The real estate market will have to readjust its pricing structures resulting in repercussions throughout the area and, in the short term, increasing uncertainty. Of course, the attenuation of the right does not eliminate all transferability; however, it will

[34]Of course, transfers along a stream may not face these prohibitions.

decrease the benefits derived from the transfer. If the buyer does not want the land, but only the water, by tying the two together an added, unwanted cost is incorporated and the total cost of the transaction is increased.

B. Potential Negative Consequences

The conditions for a well functioning water market, outlined above, depend on how much control and limits are placed on the transaction (on the buyer and seller) by the government and society. These limits often result from a desire to limit the potential negative consequences of transferability. The extent to which they should factor into the functioning of a water market depends on how society views their effects.[35] Thus, these "external" social impacts may be internalised into the transfer process. These potential negative consequences may be extracted from the experience of both the United States and Australia, and their impact on the potential benefits to be derived from transfers may be studied.

One of the potential problems with the introduction of transferable water rights is the activation of 'sleeper' licenses. A sleeper license is a license that has been allocated, but is not currently being used. If these sleeper licenses are included in the determination of allocation levels for a water supply, their activation will affect the actual use of water but will not necessarily be detrimental to the total water supply. On the other hand, if the sleeper license is not included in the total allocation level of the supply and if the supply is already fully allocated, its activation will actually increase the total use of the water above the total supply levels. If one considers a stream with its water 90% allocated and the activation of a sleeper license with a 15% stream allocation, the following two scenarios could result. If the sleeper license is included in the total allocation of 90%, the activation will have no effect on the total, overall allocation.[36] If the sleeper license is not included, its activation will increase the total allocation of the stream by 15%. The total stream allocation would be 105% and there would, inevitably, be conflicts among the licensed water users.[37] Although all licences for water use in Alberta are included in the total stream allocations, there is still a potential negative impact from the activation of 'sleeper licences'. Since Alberta's licenses are not issued for a specific period of time, and are not historically forfeited if they are not used, and since older or small license holders do not have to report their annual water use, the activation of licenses which have not been used for a while is a definite possibility. If these licences are for water basins which are already under pressure from over-allocation, as are some rivers in Southern Alberta, the activation of sleeper licences will increase the pressure on the basin and the result will be the same as if the allocations were not included in the calculation of the basin's total allocation.

There are several approaches which can be used to help mitigate the impact that

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[35] The incorporation of these social factors into the market results in the transformation of the benefits depicted in Figure 3 into net social benefits.

[36] Unless an unforeseen impact actually lowers the water table for all users.

[37] Who will actually be affected the most depends on the type of priority the system in place. In Alberta, the "first in time, first in right" principle means that junior licences would stand to lose the most from the activation of sleeper licences.

the activation of sleeper licenses has on water management and water use. The simplest is to cancel any unused licenses. Several American states have provisions dealing specifically with 'abandoned' water rights where a right that is not used, or in some cases not beneficially used, cannot be transferred; it is forfeited to the government (see Section IV: "Abandonment"). This type of action is largely based on the existence of a beneficial use provision in the license. If the state can show that the water is not being used, the right to divert the water is revoked. However, it is extremely difficult to take away a right when the lack of its historic use has not previously been considered a factor. In Alberta, the beneficial use criteria has never been a factor in the retention of a water license and cannot, therefore, be used to eliminate the threat from sleeper licenses. It is likely that in Alberta the licensees would demand compensation or even refuse to give up their license. Taking the license away involuntarily is both legally difficult and politically undesirable. However, it is just as undesirable to allow the reintroduction of allocations from sleeper licenses with its resulting impact on other rights holders. One option for Alberta could be the re-prioritising of transferred licenses. A license or part of a license which is being transferred would be assigned the same priority in time as a new license. There are, however, problems with this approach. The priority of a license is an important and potentially valuable characteristic of the license. Older licensees with a higher ranking on the priority system have a higher level of physical security than newer licensees and are, therefore, more valuable to the buyer and seller. Additionally, if the source is already fully allocated, the 'new' licensee would not be able to withdraw water, making the transferred license useless. Given that the whole idea of a system of transferable water rights is to promote new, more efficient uses of water, if the new use is assigned a low priority, thus lowering the physical security of the licensee, there is little incentive for an investor to purchase the license and a major goal of transferability is undermined.

Another possible solution is the use of 'reduction factors' where only a percentage of the water allocation may be transferred. The reduction factor would be applied to all transfers, regardless of the previous use. The result would be a decrease in the amount of allocated water and a reduction in the impact from the activation of sleeper licenses. At the same time, transfers would enable the redistribution of older licenses to new water uses. It must be noted that the use of a reduction factor might not be adequate, depending on the level of allocation in any given area (Pigram *et al*, 1992). It is, therefore, important that transfer evaluations be region specific; if a stream is already over allocated, a higher reduction factor may need to be used or a moratorium on transfers may need to be introduced. Additionally, the introduction of temporary transfers may provide a better means by which to monitor the impact of sleeper licenses on total allocations and water use in a region. The use of temporary transfers, at least initially, will enable the reversal of the transfer should there be any adverse affects. Again, the potential harm from sleeper licenses underscores the need for an accurate accounting of all allocations. Indeed, in Alberta, where there is no accurate accounting of water use (see note 2, page 2), the potential harm from the activation of sleeper licenses is very real.[38]

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[38] As will be seen in the next section, Alberta has chosen to implement a reduction factor of 10% or less, depending on the need to protect instream flows.

Provision must also be made for the possible negative impact of transfers on third parties. The impact of transfers on third parties is, perhaps, the largest source of possible negative consequences of transferable water rights. The effects may be quantifiable, such as actual decreases in water supplies, or less concrete, such as an increased uncertainty in the water supplies. The evaluation of these impacts, however, cannot be limited to other water users. As will be seen below, transfers of water may impact other sectors of the population.

The experience in the United States shows that the inclusion of a 'no injury' principle into the approval process provides for some control over the potential impacts (see page 23) and generally "promotes a more complete utilisation of water resources by providing security to water rights..." (Gould, 1989, 465). Although it is difficult to predict the impacts of a proposed transfer, it is also true that any change in the allocation of water will have an impact, or at least a perceived impact, on other water users. The use of a 'no injury' provision enables the government, through the approval process, to impose restrictions which will limit the undesirable consequences of the transfer. For example, the reduction of third party impacts can be realized through restrictions such as the imposition of limits on the quantity of the water being transferred, set requirements for return flows, or actual payment of compensation to the third party for losses.

Determination of what these restrictions should be is often difficult. As has been seen in the Colorado experience, the use of consultants and experts to evaluate these impacts can significantly increase the transaction cost of a proposed transfer. The use of a legal forum, such as the courts, also increases the potential for controversy and, therefore, costs. A less formal approach to the evaluation of a proposed transfer and dispute arbitration, such as those developed in Wyoming and Idaho, often results in compromises which compensate the injured party and avoid costly legal battles. In the evaluation of the effects on third parties, the burden of proof must rest with the protestants. The basis for this requirement is the simple fact that it is impossible to prove that 'no injury' will occur, while it is possible to prove that injury will occur. The licensee requesting the transfer should, however, show the possible consequences (physical, social, and economic) of the transfer. The evaluating agency can then determine if the benefits outweigh the costs and if any remediation should be required.

The possible third party effects are the most difficult consequences to consider in the development of transferable water rights. Because the impacts are specific to individual transfers there is a danger that regulations developed to deal with them will be based on a reaction to specific cases. Such specific regulations could result in confusion and strangulation of beneficial transfers; it could also result in the perpetual development of such specific laws as regulators seek to deal with every potential eventuality. One has only to look at the Canadian tax laws to see how well this type of management works. The development of regulations to limit or manage third party effects again requires the government to balance the need to develop a non-restrictive transfer process with the need to protect third parties. The development of general regulations for the evaluation of third party effects provides guidelines for both the agency's review and the licensee proposing the transfer. It also enables the case specific review of proposed transfers without the development of a complex regulatory structure which would make some beneficial transfers unviable.

In these areas Australia's experience is valuable. The slow introduction of transferability enabled water management agencies to constantly review their regulations to determine which were useful tools and which were merely bureaucratic blocks to transfers. As experience was gained, some states began to "remove unnecessary restrictions on transfers, eliminate management practices which distort free market operations, and incorporate only those limits deemed necessary to produce desired environmental and community outcomes" (Pigram *et al*, 1992, 144). In addition to the slow introduction of transferability, trial transfers are another means by which a water management agency can evaluate transfers. California's use of trial transfers when injury is unlikely balances the protection of third parties with the desire of the licensee to limit the transaction costs of the transfer. Additionally, trial transfers recognise that the full impacts of transfers may not appear until after the transfer is actually completed, and allow the evaluators an opportunity to view the true impact of the transfer before it is made permanent.

A major concern in both Australia and the United States is the effect that transfers may have on rural areas. "In an irrigation agriculture economy in a semi-arid environment, it is a truism that a strong and direct relationship exists between the presence of irrigation water and local economic health." (Weber, 1990, 14) The transfer of a large amount of water out of a rural community will have a significant impact on the region whether the transferred right is attenuated to the land or not. In Arizona, where water rights are attached to the land, municipalities have purchased large quantities of agricultural land in order to secure their irrigation water. The land purchased is irrelevant to the municipalities since they are only interested in the water associated with the purchase. The land on which these "water ranches" are based is removed from agricultural production and from the region's tax base. These purchases of land by cities "can severely undermine county tax revenues where cities have purchased a significant percentage of the private land" (Schupe, Weatherford, and Checchio, 1989, 428). Although the transfer in this case included the sale of the land, the same problem could result in transfers of the water right only. If the water is transferred away from irrigated agricultural land the use of the land changes, and the taxes collected from that land may drop (Pigram *et al*, 1992). Of course, if the land is still put to productive use, such as dry land agriculture, the impact is lessened. The loss of taxes impacts the government and government related activities; the loss of production impacts secondary and service industries. Not only does this type of transfer result in lost production and taxes, it may also result in increased taxes for the remaining businesses and property owners.

The transfer of large quantities of water may also place stresses on the infrastructure of the regions. In the region losing the water there is less use of the infrastructure and a lower tax base from which to draw funds for the infrastructure maintenance. This may result in a poorer infrastructure for the region. Additionally, by decreasing the amount of agricultural production in the region, there is a resulting decrease in the demand for agricultural related infrastructures, such as rail cars or grain elevators. Demand for these services by the remaining farmers may not be high enough to justify their continued maintenance. In the region gaining the water, an increase in the water supply may place increasing pressure on the existing infrastructure and may necessitate its expansion (Delforce *et al*, 1990). The cost of these infrastructure changes

must be incorporated into any review of the sale/purchase of the water right. For example, the increased taxes received by the government should offset the costs of the changes. These impacts are, however, wide reaching and long lasting and difficult to quantify and offset. If benefits derived by the region from the transfer, such as increased taxes, are not adequate to offset the cost of the changes, the transfer will actually result in a net economic loss for the region.

These problems tend to involve large transfers of water out of or into a region, but this does not mean that these transfers should not be considered. Indeed, experience in the United States has shown that creative compromises can be reached where all parties benefit from large transfers. For example, in Colorado, municipalities and irrigation companies reached a compromise whereby the cities used the companies' irrigation water and in return the irrigation companies could use the cities' treated waste water and storm water runoff. In fact, the irrigation companies received 110% return (Anderson, 1992). Because the impact of such large transfers can be so drastic, it is important to have a clear understanding of all of the impacts of the transfers before they are approved, especially if they are to be permanent. For this reason, the use of such transfers should be introduced slowly in Alberta. Permanent transfers should not be allowed until enough experience with transfers and their impacts are gained to ensure that the approval process considers all implications.

Associated with the impact on the region is the impact on the community. Because water rights are closely linked with land values, transfers of water rights, independent of the land, will have a significant impact on the value of the land. The value of the land after transfer would, in theory, be equal to the value of the same type of land in dry agricultural production. Since land is often used as security for loans, this could create problems for both the farmer holding the loan and the bank or agency providing the loan. Banks would be cautious about providing loans to water right holders who could, potentially, remove part of the value of the security for the loan; the land. Even if the transfer were not permanent, the banks would still be cautious since they must fulfil the contract if the farmer forfeits on his loan. This would impact all water rights holders, not just the ones involved in the transfer, and may result in increased difficulties in securing loans. To provide the banks with some security, the Australian states of Queensland and Victoria require the licensee to provide written permission from any party with a financial interest in the irrigation business before the transfer may take place (Pigram *et al*, 1992). This is similar to the practice of placing liens on property whereby anyone with a vested interest in that property is notified of proposed changes to the characteristics or ownership of that property. Unfortunately, this will be an additional obstacle to transfers since banks will only allow transfers where there is no possible risk to their 'investment'. One way to still allow the sale, despite the decreased value of the loan security (the land), is to provide the lending agency with a percentage of the sale or rental price (Pigram *et al*, 1992). This way the risk to the banks is decreased and they are less likely to block a transfer. However it is handled, interested parties must be included in the transfer approval process. If they are not, all water rights holders may lose the

ability to use their land and water rights as equity in loan and business transactions.[39]

The impact on the region is not limited to the economic sphere. Transfers of irrigation water out of agricultural production affects the whole farming community. In regions where irrigation and agriculture are the main sources of income there is a strong link between the water and the life style of the community. "The overall quality and character of life can be undermined in areas where historic irrigation is suddenly terminated." (Schupe, Weatherford, and Checchi, 1989, 429) In the United States a review of this impact is being incorporated into the transfer evaluation process. New Mexico's courts have overruled a proposed transfer from a 'sleeper' licensee and another irrigator because, although the proposed resort which was to get the water would provide jobs to the region, these jobs were limited to mainly service positions. The judge ruled that the ties of the people to the land and water were central to their culture and that the economic benefits which would be realized from the resort could not compensate for the resulting loss of cultural identity. The transfer was ruled contrary to the public welfare and was denied (Schupe, Weatherford, and Checchio, 1989).

Another fear of the agricultural communities is that large agribusiness firms will take advantage of transferability and will be able to block the expansion of small, family farms, and possibly even drive them out of business. These small farmers also fear that speculators will drive up the cost of water, increasing their operating costs and forcing them out of business. In Australia's experience these fears have not been realized. Indeed, actual transfers in Australia have been limited in their scope due to the restrictive conditions placed on transfers and the attenuation of water rights to the land (Pigram and Musgrave, 1989).

Still, the threats, perceived and real, that transferability poses to agricultural communities cannot be discounted. As has been explained previously, uncertainty is a major stumbling block in the development and functioning of transferable water rights as well as an efficient water management scheme. Agricultural communities and irrigators are a large source for potential transfers and, therefore, for the benefits associated with transfers. According to Pigram *et al* (1992), a large degree of uncertainty arises from the fact that historic allocations are perceived to be based on principles of social equity. Transfers, on the other hand, are perceived to be based on abstract principles of economics. These perceptions are correct because arguments for the introduction of transferability are based on theoretical propositions. The success of transferable water rights will depend on convincing the agricultural community that transfers can work in their favour in real life and that their fears can be mitigated through the approval process. For this reason, transferability should be introduced slowly into the agricultural communities and be allowed to prove its usefulness. Once the fears are shown to be groundless, an "appreciation of the potential of transferability to contribute to more efficient water management..." (Pigram *et al*, 1992) will develop.

Public interests represent an increasingly important consideration in the

[39] Although the new Water Act retains the attenuation of a water licence to a parcel of land or undertaking, it allows the transfer of the licence away from the original land or undertaking to a new parcel or undertaking. Thus, the above problems will apply even though licences are still 'tied to the land'.

evaluation of transfers. Changes to the instream flows of a water body have repercussions on numerous areas; not including other appropriators, these include environmental habitats, non-consumptive users, amenity values, and other public interests. The value of these instream flows are not well represented in the traditional market systems. They are, however, becoming increasingly important to the general public and government, and have been incorporated into the 'no injury' provisions of several American States (see pages 24-26). Provisions for the protection of 'public interests' are varied. In the United States the protections include a well defined concept in Idaho which states that transfers cannot cause harm to alternative uses of water including those related to navigation, conservation, aesthetic, environmental, and habitat uses. There are looser definitions used, such as in Colorado, where transfers are evaluated on the basis of the requirement that they not harm the rights of future users or the future costs of obtaining water. No matter what form the provision takes, its existence reflects the recognition that water has a value even if it is not being consumed.

Aside from expanding the 'no injury' provisions to include public interests and instream flow protections, in both the United States and Australia appropriations for the 'use' of instream flow protection have been issued. Generally, these appropriations are held by the state's water management agency. Although there are some negative impacts associated with such appropriations, such as conflicts between consumptive and non-consumptive users, they provide a useful tool in the incorporation of public interests into the water management system. Unfortunately, given the 'first in time, first in right' principle of Alberta's water licenses, these appropriations would have extremely low priorities. This does not discount their usefulness; they are only ineffective if the water supply is already over-allocated. For over-allocated supplies, these types of appropriations could be added to by use of a reduction factor placed on all transfers. A percentage of the transferred water would be returned to the governing agency, here the Alberta government, and reallocated to instream flow protection. In this way bodies of water which were over-allocated could be restored to a better level of appropriation. This would not only promote public interests it would also improve the physical security of other appropriators.

C. Transferability in Alberta

Transferable water rights promote the efficient use of water by providing an economic incentive for water users to conserve existing supplies and to consider its reallocation to higher valued uses. Transfers are a tool which will be increasingly important as pressure on existing water sources increases and existing management practices are unable to manage the potential conflicts. The development of an effective water transfer system is, therefore, a vital component of future water management in Alberta.

Water transfers can take many forms, but all have certain basic requirements necessary for an effective system of water transfers. Revisions to Alberta's water law and management systems must not only allow water transfers, but also to provide these basic requirements. Fundamental to any system is a system of clearly defined rights and uses; licences must clearly outline the type of use, the place of use, the point of diversion, and the time of use. Clearly defining the components of the licence provides information that

will decrease the potential for conflicts in future transfers. An evaluation of the structure of existing water sources provides a reference for the analysis of the impact of proposed transfers. In conjunction with this, a regular inventory of licences and water use will provide even more information for consideration.

Transfers must be controlled and monitored by the government. The introduction of an approval process provides the opportunity to review proposed transfers and their effect on other rights holders and on the integrity of the affected water body. The government can then place conditions or limits on any transfer in order to protect other water users. The protection of the rights of other licensees is an important component of any review process. Such protection ensures that tenure security, another important criterion for economic efficiency, for all licensees is maintained. Consideration for the transfer's impact on the environment and the economy of surrounding regions must also be incorporated into the review of potential transfers. Finally, the review process must be well defined and open to appeal to promote confidence in the system.

The input of other water users will be necessary for the efficient functioning of water transfers. Consideration should be given to non-consumptive uses, such as recreational activities, and the value they contribute to the economy. This could be managed through the distribution of licences that specify that a particular quantity of water be used for non-consumptive purposes. Such a system would ensure that sufficient water is retained in a basin for such activities.

In order to introduce a system of transferable water rights in Alberta, the current water law has been amended. The following section studies Alberta's new *Water Act* to determine if it actually incorporates the above requirements for a system of transferable water rights. This will help to ensure that the new management system will promote the economic and efficient use of water.

D. Proposed Changes to Alberta's Water Laws

The *Water Act* was introduced in the Alberta legislature in April, 1996. A package of proposed regulations was also developed and will be approved with the legislation.[40] The Act has been developed over a five year period and has undergone several revisions as a result of public hearings and consultation processes. The final version of the Act addresses many of the problems with current water management and legislation in Alberta. The goal of the *Water Act* is to develop management practices which provide for the efficient and sustainable use of Alberta's water systems and ensure the health of the ecosystems which are dependent on them. One of the major revisions, from the perspective of this thesis, is the recognition that there is a "need for an integrated approach and comprehensive, flexible administration and management systems based on sound planning, regulatory actions and market forces..." (*Water Act*, Section 2).

An important component in the *Water Act* and a first step towards better water management is the development of a water management plan for Alberta. This plan will provide an overall framework for water management planning and will be the basis for all important water management decisions, including licence and transfer approvals. In their

[40]The *Water Act* was passed in August, 1996 (see note 1, page 1).

report on the draft legislation, the Water Management Review Committee (1995)[41] proposed that this plan incorporate provincial water management principles with regional flexibility. Region specific management plans would then be developed based on this provincial plan and would include consideration for instream flow protections,[42] water users (both consumptive and non-consumptive), total water allocations, requirements during emergencies, and water conservation goals. The *Water Act* has instituted the development of water management planning areas for use in the development of these plans. The Alberta government hopes that implementation of this legislation and development of management plans will help promote the efficient and effective use of water.

An important tool by which the government hopes to promote its goal is the introduction of improved flexibility, promoted through the use of transferable water rights. Although there was significant opposition to the introduction of transferability in the public hearings on the proposed legislation, especially from the agricultural community (Water Management Review Committee, 1995), the option of transferring water licences was incorporated into the Act. As the Water Management Review Committee noted, participation in transfers would be voluntary and the introduction of transferability is important to the development of opportunities for sustained economic benefits and the protection of aquatic and riparian ecosystems. Flexibility and the associated transferability are "key to ensuring the effectiveness of water policy and legislation..." (Water Management Review Committee, 1995, 2). This sentiment is reflected in the *Water Act*. Flexibility enables holders, as well as the government, to respond to changes in society's requirements and to changes in the actual water supply, both shortages and surpluses.

The *Water Act* does place several restrictions on transferability. It limits the extent of transferability to water licences; statutory rights cannot be transferred.[43] Permanent transfers of licences are allowed only if the region's management plan had been developed with the consideration for the transfer. Since it will take time to develop a

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[41]Although the committee report was a response to the draft legislation, many of its recommendations have been incorporated into the *Water Act*, such as the requirement for management plans. The committee report provides insight into the rationale behind these recommendations that is useful in interpreting their intent. Additionally, it is likely that the review will be used to create the guidelines on which many management practices, required by the legislation, will be based.

[42]The Water Management Review Committee report divides 'instream needs' into two categories: those necessary for non-consumptive human uses, such as recreational fishing, boating and natural aesthetic appreciation; and, those necessary to protect aquatic and riparian ecosystems. The *Water Act* refers to water conservation objectives which will provide for the protection of a basin's aquatic environment, non-consumptive uses and wildlife habitats, and may include flow protections at the discretion of the Director (Section 1(1)).

[43]A statutory right enables small water users to continue their use without a licence. Statutory rights fall into two categories: household and related purposes; and traditional agricultural uses. 'Household and related purposes' include uses under one acre foot (1,250 cubic metres) per year for human consumption, sanitation, fire prevention, gardens, lawns, trees, and animals not used for commercial purposes. 'Traditional agricultural uses' includes uses up to 5 acre feet (6,250 cubic metres) per year for purposes such as stock watering in non-intensive livestock operations. These statutory rights are given priority over all other uses, regardless of the right in time.

provincial water management plan (the Act requires that a framework for provincial water management planning be developed within 3 years after the act is passed) and regional plans based on the provincial plan, this effectively prohibits permanent transfers within the first few years of the introduction of transferability. This will allow time for experience to be gained and guidelines to be developed for the evaluation of permanent transfers. It will also allow for the slow introduction of transferability; a strategy necessary to develop acceptance of transferability among water users, especially in the agricultural communities. Temporary transfers in uses and users will be allowed only if they have no adverse effect on the rights of existing users or on the aquatic environment. Transferred licences will retain their original date and, therefore, their original priority. The *Water Act* does not, however, provide any details on the actual evaluation processes. These processes will have to be developed in conjunction with the regional management plans, and with the provincial guidelines and regulations. The recommendation of the Water Management Review Committee that the evaluation process be 'clear and simple' should be used in the development of these policies and guidelines.

The *Water Act* incorporates several provisions which address some of the deficiencies in the existing legislation, outlined in the evaluation of Alberta's water law (see page 14). It also provides for some of the criteria outlined in the previous section, which are important to the functioning of water management and, therefore, of transferable water rights. The first requirement is a well defined product. Under the old *Water Resources Act*, licences were defined according to the quantity, time, location, and conditions of the licences. The *Water Act* expands the definition of water rights by linking quality to the definition of a water supply. This definition provides a basis for the evaluation of the water licence; however, there remains a problem with the existence of older licences which are not necessarily well defined. This problem is, in part, solved by the development of region specific water management plans. As outlined in the Water Management Review Committee's review of the draft legislation,[44] these plans will form the basis for water management decisions and will not only include management principles but will also incorporate details such as well defined boundaries for the water basins, and total water allocations and use. This type of information, necessary for sound management and future planning, is also important information for the buyer/seller of a licence. Thus, the management plans will provide an improved definition of the product. Additionally, subject to some conditions of confidentiality, the provision for the disclosure of information regarding the administration of the *Water Act*, including water management plans, monitoring data, and conservation of objectives, will be provided to the public (Alberta Environmental Protection, *Draft Regulations*, 1996). This will provide both buyer and seller with important information regarding the circumstances of water management in the region in which the licence is issued.

Provisions in the *Water Act* will also serve to promote the development of tenure security for water users by incorporating clear 'rules of the game' into water management policy and practices. The introduction of management plans for the province and for the individual regions will provide clear guidelines for all water users. If implemented

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[44]See note 41, page 48.

according to the Water Management Review Committee proposals, they will provide water users with an understanding of current management policies and goals as well as being a guide to the future management plans for each region. These plans will provide water users with a clearer understanding of how the government intends to manage the use of water resources well into the future. It will be a guidebook to the 'rules of the game'. Additionally, the policies will be designed to ensure that the decisions "...be based on clearly defined and consistent processes and criteria" (Water Management Review Committee, 1995, 2). The management plans will also incorporate an evaluation of water use requirements and allocation limits for each water basin. In conjunction with the policy changes, the *Water Act* updates the enforcement provisions, again providing for the development of clear guidelines that will be both fair and efficient.

At the same time, the legislation provides clear provisions for the transfer of licences from the old *Water Resources Act* to the new *Water Act*, such as ensuring that minimum flows are maintained. These provisions ensure that existing water users are not harmed by the transition to the new legislation by standardising the rules of water use and providing for fairness in the treatment of old and new water users.

These types of changes and clarifications of water management practices should in theory significantly improve the tenure and physical security of all water users. Water management plans will not only be a useful tool for new water users, it will also provide security to existing licensees in that they will have a clear understanding of the current status of water use in their region, as well as an understanding of the direction that government policy will take. Hopefully, this understanding of the rules of the game and the knowledge that the government is monitoring the water basins in a region specific manner will improve the user's physical and tenure security.

Unfortunately, while the outline of a legislative and administrative program that improves both physical and tenure security is present, it remains to be seen if the government can implement policies which work within the outline, without losing its focus in bureaucracy. Provisions in the *Water Act* provide a fair amount of discretion which must be held in check by the development of guidelines and criteria. These guidelines and criteria should be based on the need for clarity and fairness. If they are not, any potential for improvements to security for water users is lost.

The development of transferable water rights also requires certain conditions which form the basis for tenure security (see page 38) to be met within the water market. The rights of the buyer and seller involved in a transaction must be clearly identified and there must be clear penalties associated with the violation of these rights. Although the *Water Act* provides for the rights of water users and lays out penalties for any offences,[45] it provides only general guidelines for licence transfers and gives no guidelines or penalties for the functioning of the actual transaction between buyer and seller. The development of a clear and simple transfer process is only the first step in the development of clear rules for the transfer transaction. These rules must be developed before transferability can be incorporated in water management. The *Water Act* also fails

[45]These provisions are detailed in the draft "Water Offences and Penalties and Administrative Penalty Regulation", Alberta Environmental Protection, July 46, draft regulation.

to provide any guidelines for the development of a complete understanding of the true opportunity cost of the water right. Third party effects are only mentioned as a consideration for transfer approval. The mitigation of third party effects or their incorporation into the transaction costs is not considered. Finally, water licences that are transferred are appurtenant to a parcel of land or undertaking specified in the new licence (*Water Act*, Section 82 (7)). In Alberta, as in several states, the severing of the historic tie between water and land is not really feasible. The degree to which this impedes transfers will depend to a larger extent on the provisions of the transfer policy or guidelines. It is possible that the attenuation of the new licence to an undertaking instead of a parcel of land may reduce its negative effect on the flexibility and transferability of the licence.

Consideration must also be given to the possible negative effects of transferability (see page 40). As explained previously, the activation of sleeper licences may increase pressure on basins which are over allocated. The inclusion of cancellation provisions for licences which have not been used in over 3 years (*Water Act*, Section 55) may help as will the use of holdbacks or reduction factors. These holdbacks are designed to protect instream flows (see below) and may be used if the activation of the sleeper licence results in dangerously low levels. They will not be used to protect the rights of other water users. The Act does include consideration for the amount of water that has historically been diverted under the licence but, again, the actual result of this consideration will depend on the form of the guidelines which are yet to be developed. The effect of these measures will take time; however, in the long run they should provide some protection. Also important to the potential impact of sleeper licences is the development of the water management plans and the requirement to consider these plans in the transfer approval process. As explained before, the plans will be region specific and will provide consideration for the amount of water that can be diverted. If transfer and activation of a sleeper licence will result in this amount being exceeded, the transfer may be denied.

The development of a 'no injury' rule to deal with the potential negative impacts of transferability is possible given the provisions of the *Water Act*. General regulations must be developed for the evaluation of third party effects.[46] Given the experiences in Colorado, they should be aimed towards an informal mediation process and not a formal court system. Associated with the 'no injury' concept is the impact of transfers on the rural communities. Many of the most serious negative impacts are associated with larger interbasin transfers. The *Water Act* requires that no transfer of water between major river basins may take place without a licence that has been "specifically authorized by a special Act of the Legislature" (Section 47). Additionally, the Act returns the tie between the land or undertaking and the water licence. However, as was explained earlier, this may not eliminate the potential problems associated with land values. The Act does not provide any direct consideration for the impact of transfers on the community.[47] The negative impact on the social and economic structure of the community and the fear of

[46] Care must be taken in the development of these regulations to ensure that they reflect the best interests of society and not merely of special interest groups.

[47] The Act does state that "any other matters applicable to the transfer of the allocation that the Director considers relevant" (82 (5)) may be considered in the approval process.

monopolies and speculators are significant obstacles to the effective functioning of transferability.

Consideration for these impacts would again have to be incorporated into the guidelines for transfer approval and/or the water management plan. The importance of public consultation and recognition of the need to include the advice of Albertans in water management planning and decision making is a stated purpose of the *Water Act*. The development of regional plans will incorporate public consultation on a local and regional level, providing an initial forum for input. This will provide the basis for a transfer of information between government and residents which should alleviate many of the fears regarding transferability. As was seen in the Australian experience, many of the initial fears in the rural communities were never realized. If there is an open dialogue between all parties, such as in the development and revision of management plans, it is likely that these fears will be eliminated, or at least reduced.

The protection of instream flows, or water conservation objectives as it is referred to in the *Water Act*, is an important innovation in water management practices in Alberta. Although Alberta has provided some protection in previous legislation and water management policies, an overt, comprehensive policy which recognises the importance of environmental and non-consumptive uses is new. The *Water Act* recognises "the need to manage and conserve water resources to sustain our environment and to ensure a healthy environment in the present and the future..." (Section 2 (a)). The importance of water conservation objectives is also reflected in the development of management plans, in the licence and licence transfer approval processes, and in the cancellation provisions. The government can secure licences designated for the diversion of water, the operation of water works, or the maintenance of flow rates or water levels for water conservation objectives (Section 51 (2)). If this type of licence is issued within five years of the date of the Act, or if it is from water which was reserved within five years of the date of the Act, it is assigned a priority based on the date of the Act. If these conditions do not apply, the licence is assigned a priority based on the date of the government's application for the licence. This will initially give water conservation licences priority over all new licences, but not over existing ones. Although this measure is important to protect the security of existing water users, in fully allocated basins it does not adequately address the need for instream flow protection. The *Water Act* does, however, enable the government to implement a holdback of up to 10% on all licence transfers, if it is in the public's interest to do so, "to protect the aquatic environment or to implement a water conservation objective and the ability to withhold water has been authorized in an applicable approved water management plan..." (Section 83 (2)).[48] The government may choose to leave this water unallocated in the basin, reserve the water, or issue a licence to itself. A reservation issued by the government does not prevent the subsequent allocation of the water; however, it does provide more control over the use of the water since applications for allocations of the reserved water may be refused if they are not for the specified purpose of the reservation or do not meet the conditions attached to the reservation (Section 35).

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[48]Provision for these holdbacks must be part of an approved water management plan; if they are not, an order of the Lieutenant Governor in Council is required.

A licence issued by the government to itself will be designated for water conservation objectives and is assigned a priority based on the criteria listed above. This type of holdback will be useful in the long term protection of instream flows in fully allocated basins; however, as stated previously, the priority of the licence may not provide adequate protection. The *Water Act* does include the provision for the cancellation of licences if "a significant adverse effect on the aquatic environment occurred, occurs or may occur" which was not known at the time the licence was issued (Section 55 (2)). This measure, however, is designed to deal with emergencies and not the ongoing management of water supplies. Again, the protection of instream flows falls to the management plan. The plan needs to incorporate not only a clear accounting of all allocations within a stream, it must also develop a long term goal for the protection of instream flows and incorporate provisions for the realization of this goal. This is important for basins that are fully allocated and under pressure, as well as for basins which have not yet reached a critical level.

VII. Valuing Water Rights

A determination of the value of water in agriculture may be derived from an evaluation of the value that irrigation adds to the overall cost of a parcel of agricultural land. Because it uses market information to infer the value of an unmarketed 'good', in this case irrigation, an hedonic model was chosen for the evaluation. In an hedonic model, a good is broken down into its characteristics. It is assumed that the market value of the good reflects the value that these characteristics or attributes add to the overall price of the good.[49] For agricultural land, the attributes of the land could include its total size, location, soil quality, annual rainfall, long term average yields, topography, etc.[50] The price of the land, the marketed good, can be shown as a function of these characteristics:

(a) Price = f(size, location, soil quality, rainfall, average yield, topography, etc.) + u
where u represents a random error term.

An hedonic study may only be used if it is possible to break down the good into its representative attributes. It must also be shown that the actual purchase of the good can be linked to the presence of the characteristics or attributes (Colby, 1989). If the good is separable, the value of the characteristics may be extrapolated from the total sale price. Appurtenancy restrictions, such as those placed on water licences in Alberta, prevent the development of separate markets for water and land (Crouter, 1987) and allows for the use of an hedonic pricing method.

There are some potential problems with the use of a hedonic model. First, as with many forms of estimation, it requires perfect market operations where the price paid represents the true value of the good to the buyer and seller. This assumes that the participants have full, instantaneous knowledge and that transaction costs are not a factor.[51] In the real world these assumptions do not hold since prices always include misinformation and transaction costs. The degree to which these factors distort the implicit values of the assets will vary. Indeed, the reaction of the buyer/seller to a distorted price may not actually change the value placed on an attribute; the distortion may instead be allocated to the 'error' component of the equation. Another possible problem is misspecification. The hedonic model is based on the 'allocation' of a good's price among its characteristics. A good, however, has numerous characteristics making it

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[49] For additional information regarding hedonic models and how they may be used in valuing water see Rosen (1974), Crouter (1987) or Coelli *et al* (1991).

[50] It must be noted that there are other characteristics of the land which may influence its sale price. For example, external forces such as governmental influences, expectations regarding future conditions, and characteristics of the buyer and seller will also affect the actual price of the land (Coelli *et al*, 1991). However, these characteristics will not be used in the preceding analysis. The first two sets of characteristics are temporal in nature and do not apply here. The third set of characteristics would require a Rosen second stage analysis, using the implicit marginal values from the initial regression. The model used here will only apply the first stage or initial regression.

[51] The existence of transaction costs would result in a lower price for the land. The implied values for the attributes would reflect this deflated price and would, therefore, be underestimated.

extremely difficult to develop a complete model set. Failure to incorporate all of the associated characteristics will result in misspecification and invalid results. Additionally, problems may result if all of the characteristics are not adequately represented in the data set. Also, because the characteristics are often mixed and matched, the buyer must compromise. This means that the value of one characteristic may be deflated when the buyer must choose between it and another characteristic. These problems are difficult to solve. They must, however, be considered when the model is being developed and the data analysed.

Data used to provide an example of hedonic modelling was collected through the Alberta Urban Municipalities Association. The data supplied by the Association is compiled by the Assessment Operator's Branch of the Department of Municipal Affairs using information obtained from the Alberta Land Titles offices. Data supplied includes the location, parcel size, Canada Land Inventory (CLI) classification,[52] sale value, date of sale, and ownership category. A basic hedonic model was developed from these characteristics:

(b) Price = f(size, location, CLI class, year of sale)

Unfortunately, information indicating if the land was in agricultural production, and if so, if it was irrigated, was not available. With information from Alberta Agriculture, several assumptions were used to limit the data set to agricultural land. Sales of land under 100 acres in size were eliminated since with smaller parcels of land, there is a greater chance that the land will be used for non-agricultural purposes. Although some farmers have incorporated, purchases of land by companies or municipalities may also be for non-agricultural purposes. To remove these types of sales all land sales involving companies or municipalities were also excluded. To remove sales of land that may have been destined for subdivisions and possible housing developments, land sales close to a city or large town with a greater than average sale price, and sales where the property description was classified by block rather than by quarter section, were excluded. Given that the

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[52]Land classifications in Alberta is divided into 9 classes. According to the *Agriculture Real Estate Values in Alberta*, these classifications are defined as follows:

Class 1: Soils with no significant limitations in use for crops.

Class 2: Soils with moderate limitations that restrict the range of crops or require moderate conservation practices.

Class 3: Soils with moderately severe limitations that restrict the range of crops or require special conservation practices.

Class 4: Soils with severe limitations that restrict the range of crops or require special conservation practices.

Class 5: Soils that are unsuitable for annual cultivation. These soils could be improved for the production of perennial forages and pasture.

Class 6: Soils that have some natural grazing potential and improvement practices are not feasible.

Class 7: Soils that have no capability for arable culture or permanent pasture.

Class 8: Organic soils that are frequently found in the wooded regions of the province.

Class 9: Unclassified due to lack of CLI maps of the area at a 1:250,000 scale or lower.

average sale price, province wide, was less than $500/acre, sales of property with a price of over $1000/acre were excluded for the same reason, that they were likely sold for non-agricultural purposes.[53] Additionally, the high value of these parcels of land may indicate the presence of buildings which would increase the sale price and skew the results. Finally, sales of land with a CLI classification of 6 or less were not included. Soils classed as 7 or 8 or less are not suited for either cultivation or pasture land; classifications of 6 are suitable for pasture lands but it is not feasible to use improvement practices on them, such as irrigation. To remove other factors which may misrepresent the actual value of the land, any land which was either sold for a nominal value, e.g. one dollar, or was sold as a requirement of foreclosure or tax forfeiture was excluded from the data base.

Since the focus of this analysis was to be the value of irrigated versus non-irrigated land, the data base was limited to sales within a specific region of Southern Alberta where there is substantial irrigation activity. In consultation with Alberta Agriculture and the Alberta Urban Municipalities Association the following districts were included: County 4 (Newell); County 8 (Forty Mile); County 26 (Lethbridge); Municipal District 1 (Cypress); Municipal District 14 (Taber); and Municipal District 26 (Willow Creek). Dummy variables for these locations were included. A dummy variable for year was not included in the model since its presence would result in perfect multicollinearity. However, since only sales between 1990 and 1993 were considered, this time frame is not great enough to produce a significant change in the relatively stable agricultural land market. For example, the average value of land sold in the data set increased by only 2%.

It was necessary to develop a proxy to indicate if the land was irrigated or not. The potential benefit to be derived from irrigation increases if the soil is of a higher quality, therefore, if land is of a higher classification level, it is more likely that it will be irrigated. According to Alberta Agriculture, soil of a classification of 1 or 2 will most likely be irrigated. Soil of classification levels of 3, 4 or 5 are severely limited in the range of crops they can grow and require special conservation methods.[54] These soils are unlikely to benefit substantially from irrigation and are taken to be non-irrigated. This proxy does present a problem in the analysis of the statistical results. Any value interpolated from this data will represent the value of irrigation and the value of soil classification. With a better defined data set these two characteristics may be separated; however, as stated above, such a data set is not readily available.[55] The dependent variable used was the price of the land. An initial evaluation of the data indicated a relatively high level of correlation between the dependent variable (total price) and the independent variable for size. The relationship between these two variables is clear; the more land you buy, the higher the total price. To remove this collinearity, the dependent variable was adjusted to reflect the price per acre. All other variables used in the analysis had

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[53] Although some irrigated agricultural land may sell for over $1000/acre, with the above data set there is no way to determine if the high price was a result of soil conditions, development potential, the inclusion of irrigation equipment or buildings, or the actual presence of irrigation.

[54] See note 47.

[55] The development of comprehensive water management plans may be used as a forum for the compilation of this form of detailed data.

correlation coefficients which were not significant. The following equation was used in the analysis:

(c) Price/acre = β_1(size) + β_2(location) + β_3 (irrigation) + u

Due to the presence of dummy variables in the model, an intercept was not included in the model.[56]

Data were collected for sales between 1990 and 1993. To provide a workable data set, it was decided to include only those sales which took place in the last quarter of the year. This decision was based on consultations with various rural real estate agents and is based on the understanding that farmers who are interested in buying a property generally 'scout' the land during the spring and summer when the crop is growing and buy the land after harvest in the fall. Additionally, if the farmer is interested in a parcel of land that is for sale, but has not had the opportunity to inspect it, he must wait until the snow has melted to view the characteristics of the property. However, by this time the owner of the land will have begun cultivation and seeding. If the farmer decides to buy the land the transaction will not take place until after the crop is harvested. Thus, the majority of the sales of agricultural land take place in the last quarter of the year.

Using a data set of 240 observations, OLS regressions were completed using various functional forms. The functional forms initially chosen were the linear, linear-log, log-linear, and log-log forms. Analysis was completed to determine the best functional form. The forms were compared using the Davidson-McKinnon test (also referred to as the Davidson-McKinnon "J" test). This test incorporates the predicted values for Model A as an explanatory variable for Model B, and then tests the coefficient of this explanatory variable for significance. If the coefficient is significant, then Model B is not dominated by Model A. The process is then repeated using the predicted values for Model B in a regression of Model A. If the coefficient for B's predicted values is significant, then Model A is not dominated by Model B (Kennedy, 1991). The results of this analysis indicated that no model could be said to be superior. An analysis for specification error, using the Ramsey Reset Test was completed.[57] The results of this test indicated that none of the models were misspecified (see Table 1). Due to the cross sectional nature of the data, the models were also tested for heteroscedasticity using the Goldfeld-Quant Test. Ordering the data by size, this test indicated that the models were homoscedastic.

Table 1: Ramsey Reset Test Results

	log-log	log-linear	linear-log	linear
Ramsey Reset Test F(2,224)	1.8136	1.8502	1.5449	1.4601

For illustrative purposes and ease of interpretation, the results of the linear model

[56]The inclusion of an intercept in a model with dummy variables will result in perfect multicollinearity. An intercept can only be used if one of the dummies is omitted.

[57] Details of this test may be found in Gujarati (1988).

are shown in Table 2. As can be seen by the high t-values, all of the variables except for size were significant. The coefficient for the irrigation proxy variable (140.45) was positive as expected. As a proxy for the use of irrigation on the land, the variable indicates that water is a desirable characteristic. Since it is also a representation of soil class, the better the soil the higher the price. Land with a soil classification of 1 or 2 will have a value which is approximately $140 higher than land with a lower classification. Since the soil class is used in this model to represent irrigation, it can be said that land which is 'irrigated' is worth $140 more than land which is not. The variable for size indicated a negative relationship between size and price; however, it was not significant. Although this result was somewhat surprising, it is understandable in that there was little variation between the sizes in the data set. Also, the independent variable was adjusted to price per acre to correct for correlation between the price and the size of the land, removing some of the influence that size would have over the price. The remaining dummy variables for location and year were all highly significant, indicating that although the parcels of land were in fairly close proximity (within approximately 200 km), this was perhaps enough to make a difference in the price of the sale.

Table 2: OLS Estimates of the Linear Model

Variable	Coefficient	t-ratio
Size	-0.1503	-0.5153
County 4	452.4495	7.6084
County 8	316.4979	5.5973
County 26	416.5705	5.7726
Municipal District 1	288.1075	5.0795
Municipal District 14	384.8817	6.6347
Municipal District 26	385.8476	6.2835
Irrigation Proxy	140.4523	4.4171
R^2	0.1807	

Unfortunately, this model has a very low explanatory power (R^2 = 0.1823), common in cross sectional-data, and does not clearly separate the influence of soil quality from that of access to irrigation. Nevertheless, the specified model is useful as an example of how an hedonic model can be used to determine the value of water. Even this simple model strongly suggests that the implicit water right has definite economic value. The potential for the hedonic model in a comparison of the value of water in alternate uses is also important. An hedonic modelling format may be expanded to incorporate models for other types of water uses, thereby providing a comparison of the value of water in alternative uses.

VIII. Conclusion

In the last two decades, Alberta's water legislation was increasingly viewed as being deficient in promoting the efficient and effective use of the province's water resources. The development of the old *Water Resources Act* was, to a large extent, a response to the requirements of an agriculture-based economy. Although the Act provided some measure of physical and tenure security for water users, the lack of clearly defined rules and their enforcement, and the discretionary powers of the government gave rise to increasing conflict among water users as water became fully allocated. Additionally, the inflexibility of the existing licence system locked Alberta's water resources into marginally low-valued uses. The system provided no means by which water users could change; and water uses could be adjusted, to meet the changing nature of Alberta's economy. As Alberta entered a mature phase of water development, where its resources were becoming fully allocated and the development of new water supplies were no longer feasible, the existing water institutions need revision to deal with the conflicting needs of Alberta's multi-faceted, industrial economy.

The new *Water Act*, which was under review and public consultation as this research was being completed and which was enacted in August, 1996, attempts to change the focus of water management and to recognize the need to develop a flexible management system based on sound planning. The incorporation of transferability into this management system is a key step in this development. The concept of transferable water rights, explained through the examples of transferability in the United States and Australia, provides a mechanism which enables the reallocation of water rights to meet the changing demand structure. As has been seen, transferability meets the criteria necessary for the promotion of an efficient water management system. Transferable water rights provide a mechanism which enables the reallocation of water rights away from low-valued uses to high-valued uses. It is not, however, merely a transfer mechanism; transferability adds value to a resource which has, historically, been thought of as a 'cheap' resource. By increasing the value of the resource, there is increased incentive to conserve it. Farmers with obsolete or wasteful irrigation equipment may be able to finance the purchase of new, efficient equipment by leasing or selling the water they will save.

Even though the use of transferability will help develop efficient water use, there are potential problems with its use. Consideration for and protection against these potential problems must be incorporated into Alberta's water management system. The existence of problems, outlined in Section VI (beginning on page 40), will have a significant impact on how effective transferable water rights will be in promoting the efficient use of water. The *Water* Act provides the framework for the fulfillment of some of the criteria necessary for an efficient and effective water management system. For example, it does incorporate some provisions for the protection of instream flows (or 'conservation objectives' as they are referred to in the Act); however, there are still several potential impacts which need to be considered in the development of management and transfer guidelines, and in the actual approval process for transfers. The creation of regional management plans provides a means by which the requirements of transferability

may be merged with the need to avoid the potential negative consequences of transferability. One of the most important considerations, at least initially, is the impact transfers will have on rural communities. Since one of the aims of transferability is to move water from marginally low-valued uses, such as some forms of irrigated agriculture, the agricultural sector will experience the greatest number of transfers, and therefore has the potential to gain or lose the most from transferability. It is, therefore, vital that transferability guidelines help to eliminate some of the previously discussed concerns and negative perceptions regarding transferability in rural communities. Additional considerations for third party effects can also be incorporated.

The new *Water Act* changes the focus of water management in Alberta from the allocation of an abundant resource to the management of a scarce resource. However, the Act only provides the basic changes. It is the development of the management plans, incorporating guidelines for transferability and providing for the mitigation of the possible negative consequences, which will be key to the implementation of an effective and efficient system of water management.

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